



FRIDAY, FEBRUARY 22.

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Contributions.

Marking the Centre Line.

TO THE EDITOR OF THE RAILROAD GAZETTE:

All railroad right of way and its adjacent property is determined by its centre line in the majority of cases, and it is the centre line that the engineer first needs the location of when he undertakes the average survey. The centre line is the line from which he turns off angles, from which and along which he measures distances. Its correct location being the basis of so much, is, therefore, an important question in its way.

I would like you or some of your readers to tell me if there is any really satisfactory way of marking this location in an exact and permanent way, and if it is worth the trouble. Are the stone monuments sometimes used of any value?

Pluses from fixed points give position longitudinally of P. C's and P. T's, and the lateral position is easily found near bridges, stations, etc., but it seems to me that the easy finding of the ends of tangents without long measurements or tedious transit work would be a great boon to the engineer or track foreman on the ground.

E. F. J.

A Hard Top as an Element of Strength in Rails.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with much interest the articles on rail wear and rail design which have been published in your columns during the last year. I have not noticed that any one has yet called attention to the following coincidences of two elements in rail design. The top of the rail should have a hard surface for two reasons:

- In order that it may resist abrasion;
- In order to obtain maximum strength.

The first reason is axiomatic; the second will require some explanation.

It is a well known property of steel that it has less expansion inside of the elastic limit after continued rolling. To further explain, if a piece of steel of given elongation be passed through the rolls several times, it will be harder and have less elongation after the rolling than before; at the same time this steel, which has been rolled, will give greater strength to resist compression. The top of the rail, when loaded, as in service, is under compression; the bottom, being expanded by this stress, is under tension. There are, then, two reasons why the top of the rail should be hard—one to resist the wear, the other to increase its strength, a hard top of a rail being stronger to resist compression than a soft top. Another reason might be mentioned, which is, if the bottom of the rail be hard, sudden blows would be liable to fracture it, after which the crack would rapidly extend in the manner so characteristic of steel and other homogeneous substances.

I should like to hear from some of your readers on this point.

X.

[Has X observed that rails break transversely from failure of the head under compression? Such a case must be extremely rare, if it ever happens. The area of the head is about 1.3 that of the flange in ordinary sections, and the strength of the rail as a beam does not seem to be deficient in this particular. There is no apparent reason why we should go to expense to harden the rail head to increase its strength in compression. If it were practicable to harden the top it would undoubtedly be of advantage for X's first reason, but it is questionable if it is not of greater importance that the rail should be homogeneous throughout. By what method would X harden the top of the rail without adding so much to its cost as to make the process inapplicable?—EDITOR RAILROAD GAZETTE.]

Brake Beam Tests.

BOSTON, Mass., Feb. 12, 1889.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to the article on Brake Beams in the *Railroad Gazette* of Feb. 8, I would call attention to the government test of the Marden steel brake beam, believing it shows this beam to be superior to any of the beams tested (and of which you make report), and fully equal to the demands at present made upon a brake beam. It will be noticed that the test was discontinued at 20,000 lbs., as the elastic limit of our beam is 18,000 lbs. I did not consider it necessary to continue the test far beyond that limit, as that is obviously the available strength of the beam, though with load applied in excess of 18,000 lbs., the beam will not break, but will make a permanent deflection, as the test shows.

The test of the trussed beams referred to shows that a beam $3\frac{1}{2} \times 7\frac{1}{2}$ in., with $\frac{3}{4}$ in. truss rods, under 8,000 lbs., deflects 0.26 in., while the same beam under 10,000 lbs. deflects 0.40 in.; that a beam $3\frac{1}{2} \times 5\frac{1}{2}$ in., with $\frac{3}{4}$ in. truss rods, under load of 8,000 lbs., shows deflection of 0.53 in.; under 10,000 lbs., 0.41 in., and broke at centre of beam under load of 16,300 lbs.

The government test of the Marden beam, herewith, shows that under load of 8,000 lbs. there is less than 0.1 in. deflection; under 10,000 lbs. less than $\frac{1}{8}$ in., while under 18,000 lbs. the beam shows a deflection of only 0.23 in., which is about one-half the deflection of a trussed beam $3\frac{1}{2} \times 7\frac{1}{2}$ in., as per your report No. 1, and about one-fourth the deflection shown in your report No. 3. A fact to which I would also call attention is this, that the Marden beam shows no permanent deflection under any load less than 18,000 lbs., while with one exception, the trussed and plated beams show permanent set at 10,000 lbs. load.

I think these facts will be of interest to parties who are investigating the matter of brake beams.

W. O. SHELDON,
Treasurer Marden Car Brake Co.

The following are the tests, made at Watertown Arsenal, Sept. 20, 1888:

Marden steel beam.				New oak beam.			
Load Lbs.	Deflec. In.	Successive deflections In.	Deflection sets In.	Deflections In.	Successive deflections In.	Deflection sets In.	
2,000	.0206	.013504	.03		Not noted.
4,000	.0486	.0150	.....	.11	.03	
6,000	.0729	.0115	.....	.17	.03	
8,000	.0969	.0118	.....	.23	.03	
10,000	.1219	.0121	.....	.29	.03	
12,000	.1452	.0118	.....	.41	.07	
14,000	.1694	.0122	.0041	.....	.....
15,000	.17	.0006	.....	1.03	.49	
16,000	.19	.02	.....	Beam	broke at 16,700 lbs.	
18,000	.23	.02	Elastic limit	.....	.....
20,000	.55	.20	.33	.....	.....

Weight of Marden beam, 65 lbs.; length over all, 5 ft. 5½ in.; ends supported 56½ in. apart; loaded in middle, 3 in. bearing; 9-16 in. hole in web of beam at middle of length.

Weight of oak beam, 52½ lbs.; ultimate strength, 16,700 lbs.; ends supported 56½ in. apart; loaded in middle; bearing 3 in. by 3 in.; failed by shearing along the grain, splintering the beam opposite the middle bearing.

Ton Mileage Not Always a Criterion of Economy.

LONDON, Jan. 20, 1889.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In a recent issue of the *Railroad Gazette* (Dec. 14), I notice a paper by Mr. Edward Bates Dorsey giving a comparison of the working expenses of the Pennsylvania, and London & Northwestern (England). I have twice previously exposed the very fallacious methods adopted by Mr. Dorsey, but as I understand that he still declares that he is open to conviction, and asks for some criticism on his figures, I will attempt briefly to show that his method of comparing railroads working under widely different conditions is most misleading. Any figures on this point are really unnecessary to those who know the admirable manner in which the London & Northwestern and most other English lines are worked, but the idea of comparing the relative economy of different lines by ton-mileage is so taking, and has apparently so much to recommend it, that it is perhaps worth while to show that such a method has its limitations, and that the widest differences in the cost per ton-mile can exist where the cost of performing any given service is exactly similar.

The prosperity of English railroads and English freighters shows that there is some fundamental mistake in Mr. Dorsey's method of reasoning, and the principal error is not far to seek. Mr. Dorsey's comparisons are made per ton-mile, which is a fair enough standard when the conditions are similar, but is absurd and misleading when they are not.

I will take seven different cases showing that the cost per ton-mile will differ widely, though the cost of doing similar work is alike in each case.

1. A line with fair gradients, equal amount of tonnage either way, carrying chiefly cheap and rough freight, an average haul of 100 miles. Let us assume for convenience that the following average results are obtained:

Train load.....	200 tons.
Total cost of working per ton-mile.....	0.5 cent.
..... train-mile.....	100.0 cents.
Terminal expenses per ton, including all cost of switching, loading, unloading, repairs of stations, etc., etc.....	40.0 cents.
Cost of haulage per ton, including all charges incurred in hauling train.....	60.0 cents.
Average load per car.....	10 tons.
Average weight train: engine and tender, 89 tons; cars, 200 tons; freight, 200 tons; total gross weight train.....	540 tons.
Cost of haulage per ton gross weight train per mile.....	0.11 cent.

2. The same line, but with no return freight, will show a

great difference in the cost per ton-mile, though the cost of doing similar work remains exactly the same.

3. The same line as No. 1, but with light and bulky freight diminishing the average car load to 5 tons instead of 10 tons. Figures are hardly necessary to show that if the tonnage remains the same, it will double the number of cars, and the locomotive and train mileage will be nearly doubled. The locomotive and car expenses will be nearly doubled, while the traffic charges and permanent way repairs will be largely increased, and though the cost of doing similar work remains unaltered, the cost per ton-mile will be nearly doubled.

4. The same line as No. 1, but while the total ton-mileage remains unaltered, the average haul is only 20 miles instead of 100 miles. Hence, to make the same ton-mileage, there is five times the tonnage, and consequently the terminal expenses are increased about five-fold. The cost per ton will be as follows:

Haulage 20 miles at 0.3 cent.....	6.0 cents
Terminal expenses.....	40.0 cents
Total cost of working per ton.....	46.0 cents
Total cost of working per ton-mile.....	2.3 cents

Hence a mere alteration in the length of haul makes an immense difference in the cost per ton-mile, though the gradients, train load, speed, nature of freight, type of locomotives and cars, etc., etc., are absolutely unchanged.

Of course it may be objected that I have taken an extreme case, but I have served on two railroads with considerable traffic, where the average freight haul was less than half the figure I have assumed. The item "terminal expenses" is not excessive, as it includes all expenses of switching, such as a proper proportion of the repairs to permanent way in the drilling yards, and of draw gear, etc., of cars, with wear and tear of locomotives, and coal burnt by locomotives and wages of men while switching.

5. The same line as No. 1, but the freight trains must be run faster, and must be side tracked more frequently to make way for an improved service of passenger trains. I am willing to let Mr. Dorsey or any one else choose his own conditions; either he can elect to retain the same engines as in No. 1 and diminish the train load, thereby increasing the train mileage and the number of engines required, or he can have larger and more powerful engines to haul the same load at a higher speed. In either case the result will be increased expense, especially in fuel and damage to permanent way, while the quality of the rolling stock will need material improvement. The first cost of the stock will consequently be greater, and thus increase the capital and need greater net earnings, though this is not shown by the apparent cost of Mr. Dorsey's pet ton-mile. The weight and cost of the locomotives will also be increased, and the net result will be that speed is a luxury that must be paid for. It should be noted that the saving in time effected by the higher speed is lost by the necessity of side-tracking for passenger trains.

6. The same management, permanent way, rolling stock, etc., as No. 1, but different gradients. The gross weight of train hauled by one locomotive is only one-half of that on line No. 1 and is as follows:

Locomotive and tender.....	80 tons.
Cars.....	108 "
Freight.....	82 "
Total.....	270 tons.

The cost of hauling and switching this train will, as regards the locomotive, be rather more per train-mile than in No. 1, but the other items will probably be less, as the train weighs less and has fewer cars. Taking the total cost per train-mile at 80 instead of 100 cents, it will be seen that the cost per ton mile is about 1 cent instead of 0.5 cent as in No. 1.

7. The same management, locomotives, cars, etc., as in No. 2, but different gradients, the slope being always with the load. Actual practice shows that on such lines with mineral traffic very heavy loads can be hauled at a very moderate cost. It may, however, be interesting to show this by figures. Let us assume that the ruling grade is the same as in Nos. 1, 2 and 3, and that therefore the maximum average load that can be hauled up this grade is (as in No. 1) 540 tons. In this case that is the weight of the empty cars and engine and tender. Deducting the latter, the weight of the empty cars will be 460 tons, giving 35.4 cars, giving a paying load of 35.4 tons one way, or an average paying load of 177 tons, somewhat less than in No. 1. If the car load were 20 tons, the average paying load would be doubled, and the cost per ton-mile nearly halved.

These examples, which might be indefinitely extended, show, I content (a), that the cost per ton mile is *per se* no evidence of economical or extravagant working; (b), that it depends on conditions over which the railway manager and his staff have little influence; and (c), that where the method of working is very similar the cost per ton-mile can vary widely; and (d), the cost per ton-mile is largely dependent on the following conditions, which are practically independent of the economy, or otherwise, of the railway administration, and depends on the physical conditions of the district and the demands of the public:

1. The amount of return freight.
2. The nature and bulk of the freight.
3. The length of haul.
4. The gradients.
5. The speed.
6. The number of fast passenger trains.
7. The amount of terminal facilities (collecting, loading, unloading, storing, delivering, etc.), afforded by the railroad.
8. The precautions taken by the railroad against loss and damage of freight and the prompt payment of all compensation.

I need hardly point out that on every point except No. 1 the conditions on the London & Northwestern are adverse to a low cost per train-mile as compared with the Pennsylvania. The freight is more largely composed of manufactured articles, as is shown by the fact that 90 per cent. of the exports of Great Britain is manufactures, while a similar proportion of the exports of the United States is raw materials. The length of haul in the United States is about three times as great as in Great Britain (107 miles to about 37 miles), and the other items, though not so important, also tell in increasing the cost per ton-mile. Consequently, it is not surprising that the cost on English railroads is apparently higher, just as the freight from New York to Liverpool by the "Umbria" or "Etruria" is greater per ton-mile than by a sailing vessel from San Francisco to Liverpool. The freight from London to Australia by the fastest steamers is \$20 per ton, and by the slower steamers, taking three weeks longer, it is \$11 per ton, showing the influence of speed on cost. The same thing may be said of the differential passenger rates on American railroads.

Mr. Dorsey endeavors to compensate for the shorter haul by omitting the traffic charges in his comparison between the Pennsylvania and London & Northwestern. A practical man will, however, at once perceive that the locomotive charges in switching amount to a formidable figure. I understand that some years ago the London & Northwestern had 337 locomotives engaged solely in switching. The wear and tear of freight cars in switching is also a large item, and so is the wear of rails, switches and crossings, when numerous individual yards contain 30 miles of track. The length of haul is an immense factor in working expenses, I have for instance fired on two engines, one running main line through freight and the other local freight and switching. The latter had the larger train crew, but a week's work would give about 80 train-miles, while the former ran 864 miles. The train load was heavier with the main line engine, and hence the cost per ton-mile for locomotive power and wages of train hands and many other items was as about 14 to 1. These are actual facts from practical experience and not mere paper guesswork figures.

Mr. Dorsey says that the Duke of Sutherland cannot export his North Staffordshire coal and iron owing to the high railway freight charges. Is Mr. Dorsey aware that the products of North Staffordshire are exported in large quantities to almost every country under the sun in the face of hostile tariffs, and that half the plates and dishes in the world are made within a few miles of Trentham, the Duke's house in Staffordshire? The coal is not largely exported, partly because it is wanted at home and partly because it is not of the most suitable quality for exportation, but the district does a far more profitable trade in what it is particularly fitted to export, notwithstanding the fact that the pottery has to pass over English railways. HELIOS.

Wheel and Axle Gauge—Union Pacific.

The accompanying cut shows a wheel and axle gauge used on the Union Pacific. Fig. 1 shows the gauge in position; fig 2 shows a larger view of the gauge in contact with the wheel flanges. The gauge is used, as shown, to test the minimum distance outside of flanges. When the flanges are of the proper thickness there is $\frac{1}{8}$ in. play at A. When the gauge is reversed the edge B is in the position occupied in the engraving by projection A. The flanges ought not to be at a greater distance apart than from B to B. Therefore, in that position the gauge acts as the maximum gauge, and it is intended that between flanges should never be more than 4 ft. 5 $\frac{1}{2}$ in. This distance is the distance between the outer edge of B on one end to the outer edge of the corresponding projection of the other end of the gauge. In the same manner the distance between flanges is not intended to be less than 4 ft. 5 in., which is the distance between the outer edge of the projection A on one end and the outer edge of the corresponding projection on the other end of the gauge. The distance between the edge D on the one side and D on the other is 4 ft. 7 $\frac{1}{2}$ in., which allows $\frac{1}{8}$ in. play between the wheels and the track and $\frac{1}{8}$ in. on each side. The length of the gauge over all (5 ft. 4 in.) is the minimum distance between the outsides of the treads of the wheels. When the gauge is in position the outsides of the treads of the wheels should not fall inside of the ends of the gauge. This gauge is marked as follows:

Maximum between flanges, 4 ft. 5 $\frac{1}{2}$ in.; maximum outside of flanges, 4 ft. 7 $\frac{1}{2}$ in.; maximum between flanges inside, 4 ft. 5 in.; minimum over treads outside, 5 ft. 4 in.

This gauge is called the foreman's inspection gauge, and is made of hardwood upon which are bolted templates of the shape and dimensions given in the cut. For the purpose of illustrating the meaning of the different portions of this gauge, a section of the standard rail $\frac{1}{2}$ in. thick is attached to each end in the proper position.

New 86 1-2 lb. Rail Section of the Northern Railroad of France.

The rail section which is shown in the accompanying illustration has recently been adopted by the Northern Railroad of France to replace the 60-lb. section which that road has used for 20 years. The old section replaced iron rails of a weight of 74 lbs. per yard, and has given very satisfactory service. It was designed for a road on which the locomotives carried a weight of 27,770 lbs. on a driving axle and were expected to make a maximum speed of 60 miles an hour. The weight of these engines was 105,572 lbs. on a base 44 ft. 10 in. In 20 years 3,040 miles of line was laid with the old 60-lb. section. Of these rails 39,406 have been taken up, of which less than 3,000 were broken in service. The iron rails which preceded this section had an average life of five or six years upon the greater part of the system.

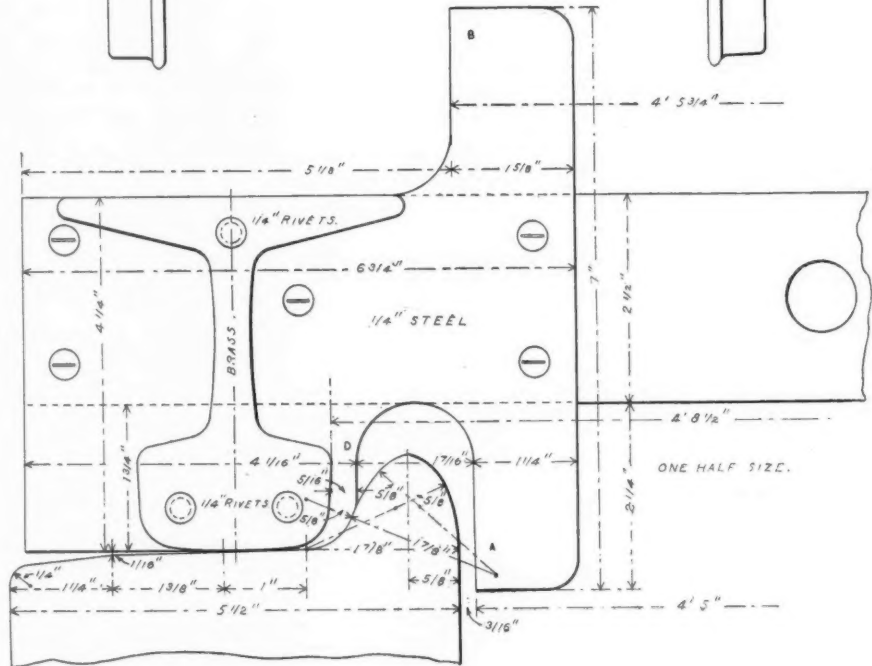
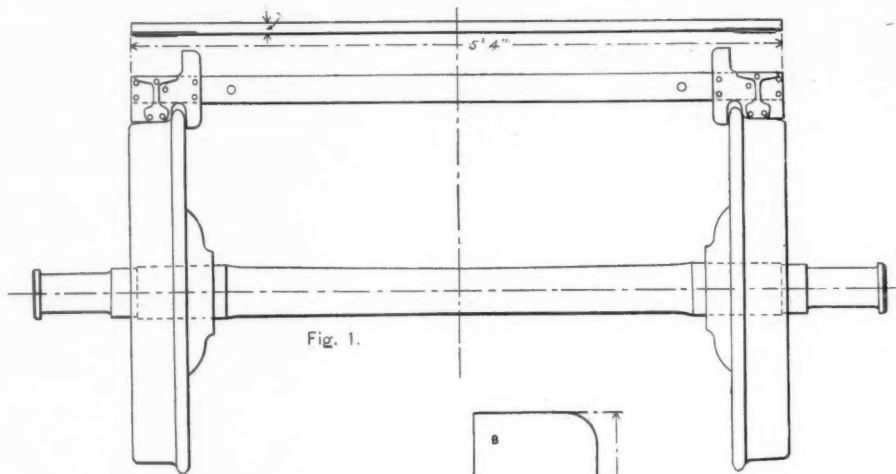
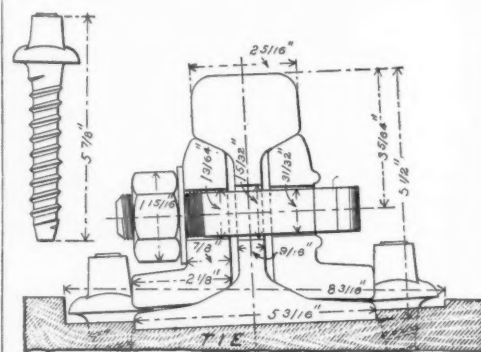


Fig. 2.

UNION PACIFIC WHEEL AND AXLE GAUGE.

More recently locomotives with a load of 31,327 lbs. per driving axle and a weight of 171,030 lbs. on a base 52 ft. 10 in. have been introduced, and heavier rolling stock has been brought into use in fast trains. In consequence of the increasing weight of rolling stock it has been decided to increase the rigidity of the track. The question arose whether this should be done by increasing the number of ties or the weight of rails. It was decided not to increase the number of ties, for the reasons that those of proper dimensions have come to be somewhat dear in price, and that the track work increases somewhat with the number of ties, while tamping is made more difficult by diminishing the



space between them. On the other hand, at the present price of steel rails, it was thought more economical to increase the weight of the rail, which does not directly add to the labor of maintenance.

The standard rail which is now adopted is 39 ft. 5 $\frac{1}{2}$ in. in length, but a rail of 39 ft. 1 in. is used on the inside of curves. Ties are placed as follows: 12 ties per rail where the usual speed does not exceed 50 miles an hour, 13 ties per rail where the speed is from 50 to 59 miles per hour, 14 ties per rail where the speed exceeds 59 miles. These rails are laid with even joints, suspended, and the joint ties are 2 ft. 3 $\frac{1}{2}$ in. between centres.

The rails are laid in notches previously cut in the ties, as shown in the illustration, and are fixed to each tie by a galvanized screwed spike. Between the rail and the tie is placed a sheet of tarred felt, which covers the whole surface of the notch. The dimensions of the rail and joint are shown in the illustration. The head of the bolt, it will be seen, is flattened on two sides and engages in a groove in the angle-bar to prevent its turning. The angle bars are 25.6 in. in

length, and their flanges are notched at the ends to receive the heads of the screwed spike, in order to prevent creeping.

Records of Performance of Continuous Heating Apparatus.

The most common complaint concerning continuous steam heating systems is that the temperature in the cars is either excessively hot or severely cold. People who write to the newspapers, sarcastically suggesting that railroad superintendents occasionally take a ride in the cars of their roads, make this the burden of their wail, and many persons not at all unfriendly to railroads hold the same view. The New York railroad commissioners have gone so far as to propose a law requiring thermometers in cars. Although a thermometer will not make a lazy brakeman shut off or turn on the steam at the proper time, and the suggestion that the law is only to provide an impartial referee when brakemen and passengers disagree is therefore eminently sensible, it still is well to have a guide where so many different judgments come in to affect the conditions and where the same person may so readily err in different directions at different times. But a thermometer, to be of value, must be used, and this use should be systematized. As illustrating this point we give here a condensed sample of the records kept on the trains of the Boston, Revere Beach & Lynn. The engineer and the brakemen report on

R. R. & L. R. R.
Train Steam Heating Report.
Train No. 1. Locomotive No. 9.

Feb. 16, 1888.—Outside temperature: 7 a. m., 5° below; noon, 13°; 6 p. m., 14°.

	Pressure in train pipe. Lbs.	Temperature in first car.	Temperature in second car.	Temperature in third car.
6.10 a. m.	20	68	61	62
	22	67	61	62
	22	64	61	62
7.00 a. m.	21	61	60	60
	21	60	60	60
12 noon.	20	64	62	62
	22	64	63	61
	24	65	64	61
6.09 p. m.	18	68	68	66
	15	68	68	66
	14	65	65	66

Feb. 17, 1888.—Outside temperature: 7 a. m., 24°; noon, 39°; 6 p. m., 34°.

	Pressure in train pipe. Lbs.	Temperature in first car.	Temperature in second car.	Temperature in third car.
6.10 a. m.	15	70	70	70
	10	70	70	70
	8	70	70	70
7.00 a. m.	8	69	70	68
	8	69	70	68
	5	68	70	68
12 noon.	7	67	65	66
	6	67	65	66
	5	69	66	66
6.09 p. m.	3	65	65	67
	5	67	66	67

choice from among the others. My experience with steam couplers was made last winter, and I speak on that basis. I should discard at once all couplers which depend for flexibility on slip joints and ball joints, as they are sure to leak. This is so evident to mechanical men that I do not think I need cite any of the evidence in support of it. We come, then, to a choice of some one of those which depend for their flexibility on a flexible rubber hose, and of those there are a great many, and quite a number of good ones. I should also limit myself to those which uncouple automatically when the cars break apart, as otherwise there is always more or less trouble from breakage of hose. It has been claimed that the pocket formed by this kind of coupling is liable to become full of water, and either freeze, or at least, cause an undue resistance to the passage of steam. In regard to this I will say that the facts prove that none of these claims are true. They do not collect water and the resistance to the passage of steam is so slight as to be practically inappreciable. We are brought then to a choice of some one of this class of couplings, i. e., those which depend for flexibility on a flexible rubber hose, and those which uncouple automatically when the cars break apart; and I believe that if uniformity is ever attained it will be by a choice of one of this class of couplings.

Of this class there are a good many that are good enough for all practical purposes; but when it comes to deciding which is the best of them I do not believe it will ever be possible to get railroad men to agree. Hence, if any one of them is adopted by all, it will not be considered the best by all railroad men; and, therefore, there has got to be a compromise of some kind.

My principal reasons for recommending the Westinghouse 1½ in. air brake coupling with a hard rubber gasket are, as stated in the report, first, that the train hands are all familiar with it; and next, the patent having expired it is much the cheapest. To this I will add that I have watched its operation on the New York & New England, and also on the Boston & Albany, and I have failed to see any objectionable feature about it; and, as far as I could see, it worked in a thoroughly satisfactory manner; indeed, I have not seen any coupling that worked any better. I have read and heard objections made to it, but all of them have been purely theoretical and are not borne out in practice. I have not yet seen a railroad man who has used it able to cite any trouble that he has had with it. This coupler can be bought for about one-sixth the price of any other coupler in the market. The Sewall coupler is practically the same thing, just as simple and effective. The only fault to be found with it is that it is patented.

Mr. SHINN: Prof. Lanza has referred to the fact that the New York & New England is using the Westinghouse coupler. We adopted it because it was cheap and convenient; we had it in stock and it was sufficiently effectual for temporary use, and while using it we could see if anything better appeared; we have not committed ourselves to anything. I never knew of any considerable amount of steam heating that had not some leakage. That has been partially overcome in this instance, and I think it will continue to answer the purpose until we are called upon by the Commissioners to adopt something permanent, or until the roads in general agree upon what is best.

Mr. CHASE: Mr. Westinghouse is one of those persons who believe in a system of steam heating that will ultimately work out the greatest degree of success; and success in this matter must depend upon a return system, taking the condensed water back to the locomotive; and one of the elements of that system will be very low pressure of steam compared with the pressures that are generally used, which result in overheating the cars. It has been proved that the use of a pocket between the cars adds to the necessity for high pressure, and it has been abandoned with good results.

Mr. SEWALL: When we commenced experimenting with steam heating we attempted to use the Westinghouse coupler, but found that the gasket would not remain tight, although it might in the use of the air brake coupler. In the use of steam, by the expansion of the throttles, the gasket will press so tightly that the feature of automatically uncoupling will be liable to be destroyed, and there is a possibility of a rupture of the whole, if the coupling is so tightly adjusted as to prevent any leakage. We made an effort to use that coupler, without success, and found we must devise one without those fatal defects, and the result is the one we are now using, which has proved successful in its action. It is very simple, and one of its features is an air space round the tube, which acts as a non-condensing surface, so that we get the least amount of condensation.

Steam Heating—New York Railroad Club.

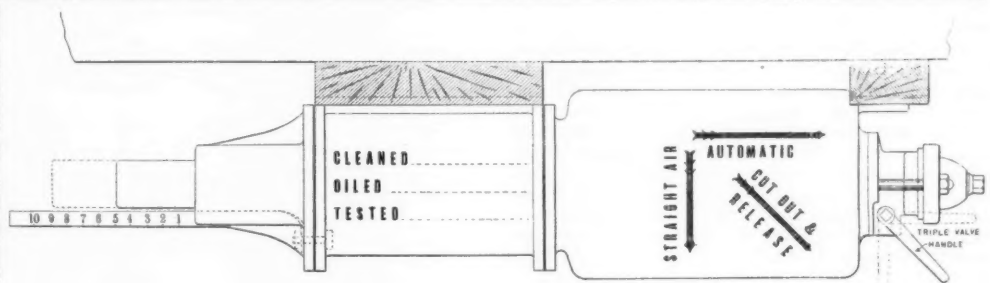
At the regular meeting of the club, Thursday evening, Feb. 21, Mr. E. E. Gold read a paper on this subject. He opened with the declaration that he should not consider the general question as to whether or not the heating of trains by steam from the locomotive is practical, or safe, or economical. These questions he considers to have already been settled by actual practice, and it is only those who have not had experience with this method of heating who were skeptical as to its practicability. Those railroad officers who have had most experience with steam heat find that it is impossible to detect any increase in coal burnt on the locomotives. The danger of scalding passengers with steam from broken pipes Mr. Gold considered hardly worth speaking of, as the chances are great that in any breakage of the line of piping the rupture would be outside of the cars, and the escaping steam would be dispersed harmlessly in the open air. Moreover, it is found by experiment that steam escaping at a pressure of 80 lbs. will produce but slight inconvenience in a car. In an experience of over seven years the Gold Company has known of no case of injury to a passenger or employee from a defect or failure of its apparatus.

Consideration of the subject, therefore, becomes a question of details, such as couplings, traps, method of piping, and especially the control and storage of the heat. Mr. Gold considers that by the storage system as furnished by his company the difficulties of rapid fluctuation of temperature, which are common to plain pipe systems, are overcome. It is found that cars can be kept at a very even temperature, for several hours after the locomotive is cut off, and consequently with the storage system the surplus of steam generated while running down grades or standing at stations may be used for heating. There is a further advantage, in that cars can be kept warm till they are cleaned and dried after being laid up.

The Gold storage heater, of which over 6,000 are now in use, was then described. Our readers are quite familiar with the apparatus as well as with the method of applying the Gold system to the Baker heater.

The thermostatic trap and automatic relief valve used by the Gold Co. were briefly described. The trap relieves the pipes of the water condensation while steam is on, and the relief valve empties them at once when the pressure is taken off. Thus there is no danger of any water freezing in the pipes or traps. This relief valve is so placed that it may be operated by the trainmen, and should the trap become inoperative from any cause the heater can be kept in perfect operation by the relief valve till the trap can be put in order.

The Gold coupler was also described. In its latest form it is fitted with case hardened steel gaskets turned perfectly true, making what is virtually a ground joint. The com-



AIR BRAKE MARKING—UNION PACIFIC.

pany has also a combination coupling for use between cars fitted with different forms of couplers.

A plan for supplying steam to a train of cars for running a dynamo for electric lighting and for heating and cooking is now offered by the Gold Company. By this arrangement the pressure in the train pipe is automatically reduced for the heating apparatus, while steam at full pressure is supplied to the dynamo and at such pressure as is desired to the cooking range. In this way a train may be thoroughly equipped with the latest modern improvements and absolutely without fire except in the fire-box of the locomotive.

Bartlett Automatic Car Seal and Lock.

The illustration shown in this issue is a device for locking and sealing freight cars. Fig. 1 shows the door nearly closed and the lock in the act of automatically engaging with the staple where it is fastened by means of a gravity dog on the under side of the hasp. To seal the fastener, it is only necessary to lift the hook upwards with the left hand and slide a card prepared for it under two wires at the rear end of the fastening. The hook is then allowed to re-engage with the staple, the thumb piece is given a half turn to the left and the door is locked and sealed, as seen in fig. 2. When in this position, the card is thoroughly protected from the weather by means of the close fitting parts about the seal case, which is flanged on all sides and covered with a piece of plate glass set into the frame flush with the surface. This glass being flush prevents the retention of snow or ice upon it in winter, which might otherwise obscure the view of the seal card.

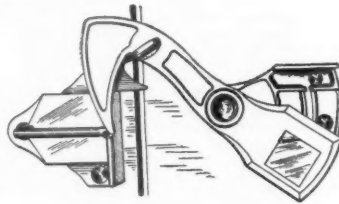


Fig. 1.

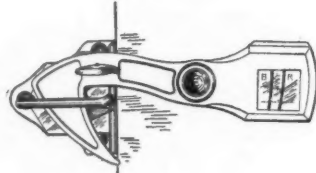


Fig. 2.

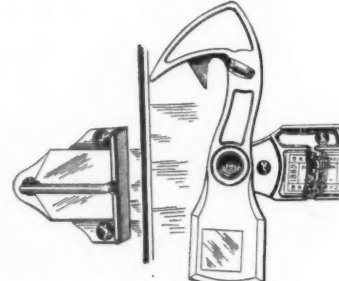


Fig. 3.

It is impossible to open the door when thus sealed without cutting the seal card, as is shown in Fig. 3. This is done by a knife on the under side of the cover of the seal case, entirely hidden from view. This cut is so distinct that it is readily perceived by the trainmen passing along without close or special examination. This device has been in use on the Burlington & Northwestern during the past season and has given satisfaction.

The length of the fastener is about 10½ in. over all, and it is designed to be made of malleable iron and to be strong enough to take the place of the ordinary freight door fastener, though being in that respect superior on account of its automatic action.

In case a car equipped with this seal is on a foreign road where no copyrighted cards are to be had, it can be sealed with the ordinary tin or wire seal, as provision has been made by making a hole in the thumb piece for such emergencies. Further information can be had by addressing Mr. E. C. Bartlett, Omaha, Neb.

Air-Brake Marking—Union Pacific.

The accompanying illustration shows the method of marking the air-brake cylinders in use on the Union Pacific. Upon the cylinder is marked the date when it was cleaned, oiled

and tested. Upon the air reservoir are painted arrows, as shown, in order to show the uninformed trainmen how to place the triple valve handle in order to change the brake from automatic to straight air, to release the brake or to cut it out entirely. To assist car inspectors in their examinations of the air brakes a graduated arm is bolted to the cylinder head, which has painted upon it figures, as shown. This enables them, at a glance, to note the length of travel of the piston rod, and thus to determine at once if the brake rods need to be lengthened or shortened. The instructions to painters and car inspectors are given below. A great demand for a concise system of marking which is easily comprehended and will facilitate the performance of the duties of an inspector is introduced by the use of long freight trains running at frequent intervals.

Instructions.—The travel of the piston should be maintained (as near as possible) at 5 in. and must never exceed 9 in., an adjustment of rods, etc., being made before or when this point is reached. That the travel at all times may be discernible a strip of wrought iron, which has inches marked thereon, is secured to the cylinder by one of the cylinder head bolts and extends along the piston. All markings on cylinder, reservoir and indicator to be white on black ground. The arrows and words on reservoir show the position of triple valve handle to vary condition of air on car as may be required. The cylinder and triple valve must be cleaned as frequently as once every three months and brake be tested (and travel of piston shortened if necessary) at every available opportunity. After cleaning, oiling or testing brake, the name of place, as Omaha, Grand Island, etc., as the case may be, together with date, must be marked on the cylinder with chalk, as below:

Clean'd Oma - 9 - 23
Oiled Oma - 9 - 23
Tested Gr Is'd - 7 - 14

The markings on cylinder to be on smooth side only. The markings on reservoir to be on both sides.

The New Trunk Line Agreement.

The trunk lines have adopted the revised agreement, which has been prepared by Commissioner Albert Fink in compliance with the vote of the trunk line presidents who met with the Western presidents and the bankers at the meeting in New York City, Jan. 10. It went into effect Feb. 20, and we summarize its main provisions.

Under the head of general principles it is provided: "That all measures necessary to carry out the object of the agreement shall be considered and acted upon jointly; that all questions which cannot be settled by mutual agreement and are necessary to be settled in order to carry out the object of the association shall be decided by arbitration; that the parties are not to allow their roads to be used by connecting or other transportation lines in a manner which will render it impossible to carry out the object of the agreement; that the parties to the agreement will aid in the enforcement of the Inter-state Commerce law; that it is a fundamental principle of the agreement that the presidents, or chief managing officers of the company, shall assume the responsibility of carrying it into effect; that, if the maintenance of uniform tariffs does not ensure to each company a fair proportion of the business, the tariffs may be readjusted for the purpose of bringing about a fair distribution of traffic."

A more direct method is provided for bringing important questions to the attention of the Board of Presidents and having them more promptly decided by arbitration. The principal objection to the old agreement was that the responsibility was divided among committees which could not act promptly and efficiently. More direct power is now given the Commissioner, and, if he meets with objections, he is required to bring the matter at once to the attention of the Presidents. The Commissioner is appointed the executive officer of the association, and the appointment of an Executive Committee is provided for, to consist of the Vice-Presidents. The Commissioner shall carry out all measures unanimously agreed to by this committee. In case of disagreement he is to act as arbitrator, his decision being subject to revision by the Board of Presidents.

The freight and passenger committees shall consist of the General Traffic Managers or General Freight or Passenger Agents of the respective companies.

Article XIII specifies the method for conducting arbitrations. The Commissioner is to act as arbitrator, but, in case his decision is appealed from, two additional arbitrators may be selected, the majority vote of the Board so constituted to be final. The Commissioner, or the Board of Arbitration, shall also decide what are proper subjects for arbitration, in case that question arises. This article also provides that members who are not willing to abide by the decision of the Board of Arbitration shall withdraw from the association.

The Statistical and Inspection Bureaus are to be maintained and the inspection system is to be perfected and extended.

A road complained of must investigate in good faith, and apply the proper remedy if complaint is just. If, however, the complainant is not satisfied with the investigation, and the violation complained of is not stopped, the complaining company has the right to reduce the tariff to meet the reduction whether the latter has been made openly or by secret devices, but such reduction shall not be made, except upon due notice from the complaining company to the other parties to the agreement, and must take effect simultaneously by all lines. It is also provided that in case of a violation of the agreement, which is also a violation of the inter-state law complaint may be made directly to the Inter-state

Commerce Commission, or may be brought to the attention of that body through the Commissioner. The latter is authorized to furnish the Interstate Commerce Commission with any information in his possession which will aid in discovering and punishing any violation of the inter-state law. No contracts shall be made which guarantee rates for any period of time, or which are not in strict conformity with the principles upon which the Trunk Line Association is based.

Axles for 60,000-lb. Cars—Western Railway Club.

At the meeting of the Western Railway Club of Feb. 19 a paper was read by Mr. G. W. Rhodes, "Axles for 60,000-lb. Cars," which we print in somewhat abridged form.

Axles for cars of 60,000 lbs. capacity was one of the topics sent in early in the season. Whoever named the subject may wonder why it has not come up before for discussion. To be frank the best form of axle for 60,000-lb. car was so thoroughly gone over by the club at its session last season that we feared that a repetition of it would lag in interest, and trusted there would be so many other topics to engage our time, we should not have to consider this one. The difficulties of evasion, however, soon began to be encountered. On the arrangement last fall of the various committees appointed by the Master Car Builders' Association, the writer was associated with two other members of the Association to present the best form of axle for 60,000-lb. cars at the June convention of 1889. In investigating a topic which has in view the recommendation of a form or design of any of the many parts that go to make up an engine or car, the labors of the investigators are actually much lighter when they go over the ground for the first time. The zeal with which they go into the work is constantly kept up and maintained by new phases of the question which present themselves and by the hope of all earnest committees that the result of their labors may be rewarded by the adoption of their report and designs by the association appointing them; when a subject has been so thoroughly gone over, however, as the 60,000-lb. axle has, when two forms of axles have in two successive years been submitted to letter-ballot and summarily rejected, it leaves but little hope of more successful results to the committee to whom the subject has been delegated.

Seeing other committees, however, in active pursuit of knowledge on the subjects entrusted to them by the Master Car Builders' Association, we felt that not only would it reflect on the lines we represented in the Association, but that it would be discourteous to the members to go before them with a report drawn up without having availed ourselves of legitimate sources and channels through which information may be drawn out which always adds materially to the interest of any committee's report. With this in view, our committee has lately held a preliminary meeting and mapped out a course for its work. At this early stage of our investigation we shall not anticipate the report that may be submitted next June by presenting a design for the axle under consideration; nor shall we enter into the various calculations essential before coming to a correct determination of the dimensions of the axles. These points were thoroughly gone into by Mr. Schroyer in the thoughtful paper which he presented to our Club in October, 1887, which was followed up by Mr. Forsyth's careful report covering the same ground and read at our January, 1888, meeting. In presenting the subject to you, it will be more with a view of showing what has already been done and in the hope that by bringing up the various phases of the question to provoke discussion, not necessarily confined to this meeting, which may aid those in determining at a later date what course in view of the present general car interchange it may be their interests to follow even at a sacrifice of their present standards.

At the annual convention held at Minneapolis in 1887 an axle of dimensions, as shown in fig. 1, for cars of 60,000 lbs. capacity, was presented and subsequently submitted to letter-ballot vote. The leading dimensions are: Journals, 4 in. x 8 in.; wheel fit, 5 in.; centre of axle, 4 3/4 in.; distance from centre to centre of journals, 6 ft. 3 in. The design was rejected by the following vote, two-thirds being necessary for adoption: In favor, 397; against, 253; total votes cast, 650.

At the Alexandria Bay meeting of 1888 another design was, after a spirited and vigorous discussion, also voted to be submitted to ballot vote. A marked difference will be noticed in the diameter of this axle; the journal is 4 1/2 x 7 1/2 in.; wheel seat, 5 1/4 in.; centre of axle, 4 3/4 in., and distance from centre to centre of journals, 6 ft. 3 in. This design has also been voted down; in favor, 234; against, 307; total votes cast, 531.

The discussion at the Alexandria Bay meeting disclosed a growing disposition towards the larger diameter represented in Fig. 2. Several of the members of our Club who last winter questioned diameters as large as 4 1/2 in. for journals, 5 1/2 in. for wheel fit and 4 3/4 in. for centre of axle now advocate them. We are informed also that since the Alexandria Bay Convention several important lines, not represented in the Western Club, and who have heretofore opposed diameters as great as those of the later design, have also changed their views; and that it is now entirely probable that in so far as diameters are concerned we shall be able to come to an agreement at our next annual convention. In discussing the diameters of axles we frequently get into arguments over small figures; one will want a wheel fit 5 1/2 in. diameter, while another wants it 5 1/4 in. A second member will insist that 4 3/4 in. is much too large for the centre of the axles and that 4 1/2 in. is preferable. At the last annual convention while such points were under consideration, an Eastern member who has always been looked upon as one of the pioneers and pillars of the Association while advocating the larger diameters said, he was reminded of a precept or law our much respected Secretary, Mr. M. N. Forney is said to have received upon a certain occasion from his superior when he was an apprentice in the machine shops at Baltimore, viz.: If you must make a thing strong, make it very strong. This is exactly what prudent and intelligent engineers and builders do. After figuring out carefully the greatest strains and stresses the structure under design will be subjected to, they then proceed to make it "very strong," or, to express it a little differently, to allow what is termed a factor of safety over and above all calculated strains. In bridge construction, the usual factor of safety over and above all calculated strains is between five and six, based on iron, with an ultimate strength of from 48,000 to 54,000 pounds. The diameter of the axle for a 60,000 pound car represented in the Alexandria Bay design, gives but a factor of safety of about 3 1/2 based on iron having an ultimate strength of 44,000 pounds, which is about what scrap-iron axles will average. It would appear then that our diameters are none too large and that the more conservative of us need not have any scruples on the score that we may be getting an axle with more weight in it than is actually necessary.

Where then, you will ask, is the insurmountable difficulty now in adopting a standard axle for 60,000-lb. cars? It is a matter of lengths, a question of 6 ft. 3 in. or 6 ft. 4 1/2 in. from centre to centre of journal. Let us try and view the question impartially from both standpoints. The dimension of 6 ft. 3 in. from centre to centre of journal has been the

Master Car Builders' standard since 1873, and subsequently was adopted by the Master Mechanics' Association. Some of the members wish to change this with the 60,000-lb. axle to 6 ft. 4 1/2 in., chiefly in order to secure a journal 8 in. long, and at the same time retain the 2 1/2 in. dust guard. There can be no question as to the importance of ample journal surface. An advocate of the 1887 axle states that his experience is that the pressure per square inch of journal bearing should not greatly exceed 350 lbs. A prominent inventor some years ago, in advocating a large journal, stated that if adopted, the pressure per square inch on the brasses would be reduced a sufficient amount to insure a much more perfect lubrication than railroad people are now accustomed to where the journals are so small compared with the weight to be carried. The writer's views on this question were given with some tables and figures at our March meeting last year, and need not here be repeated. Again it is claimed that if the axle is made large enough in diameter at wheel seat and dust-guard to stand the strains which come upon it, it will be found too large to enter the opening in the back of the Master Car Builders' journal box; that while this might be overcome by turning the axle down when too large, the correct proportions to meet the strain uniformly would then be destroyed,

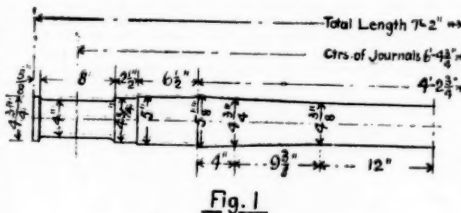


Fig. 1

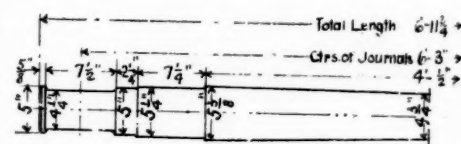


Fig. 2

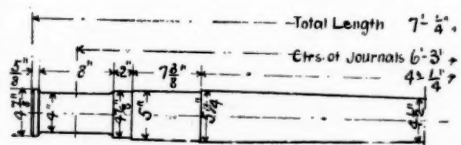


Fig. 3

and the middle part of the axle would be too large in proportion to the load, and the vibrations would be localized where reduction had been made, making it liable to break at the reduced point. These arguments are deserving of full and careful consideration. One of the great Southern lines, anxious to retain the journal centre distance of 6 ft. 3 in., and at the same time realizing the importance of minimum bearing surface, has adopted for its heavy cars the design shown in fig. 3. In fig. 4 this axle is shown in a Master Car Builder's box; the full lines represent the old 3 1/2 x 7 journal, and the dotted lines the 4 x 8 journal.

The majority of the advocates of 6 ft. 3 in. journal centres

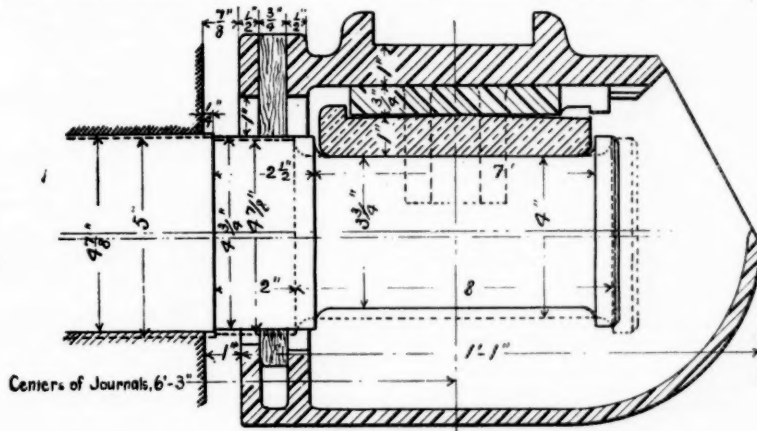


Fig. 4.

feel that more economy will be realized in retaining these centres by the subsequent use that can be made of the axle, even at a sacrifice of journal length than otherwise. They lessen the pressure per square inch of bearing by increasing the journal diameter, and while recognizing the claim of greater liability to heat by the increased speed of the rubbing surfaces cite the 5 in. diameter of engine truck journals on wheels of 30 in. and 28 in. diameter, as showing that the heat from this increase in speed of rubbing surface is taken care of by the additional metal in the journal for carrying the heat off. The strongest argument, however, is the subsequent use the axles may be put to, that is to say the practicability of removing the axle from a 60,000 lb. car, and transferring it to a 50,000-lb. car and from that to a 40,000-lb. car and so on.

A question which undoubtedly influences many in the consideration of this 60,000-lb. car axle is whether it is really wise to consider it as limited to a car of that capacity; is it not likely that we may have to provide for axles in the future for cars of 70,000 and 80,000-lb. capacity? It is the opinion of many that the increased pressure between wheel and rail will hardly permit of considering a 70,000 or an 80,000-lb. car with 4-wheel trucks and 33-inch cast-iron wheels. The effect of heavy pressures on small wheels revolving at high speed is well known by our experience with engine truck wheels. The smaller mileage is well attested to by the

smaller guarantees wheelmakers give and the growing demand for something that will last longer, shown by the gradual introduction of the steel tired engine truck wheel. In a paper read by Mr. D. J. Whittemore, Chief Engineer of the Chicago, Milwaukee & St. Paul, at the recent annual meeting of the American Society of Civil Engineers, the opinion is expressed from facts presented that rail-failure and incidentally wheel failure do not result so much from abrasion, as owing to the fact that they are submitted to pressure beyond their elastic limit. If this is the case now will it be wise to load them still more heavily. But can we not learn something on this subject by looking at our passenger equipment? The question has already been met there. The loads on baggage-cars, chair cars, dining cars and sleepers have increased so in some cases that the ordinary four wheel truck and axle was no longer satisfactory. How is the question met? Do we increase the axle to unusual proportions? No, the simplest and most rational way out of the difficulty seemed to be to use the same axle but more of them, and so it is believed the question will be met when we are called upon to provide axles for freight cars of much greater capacity than our present heaviest cars; with some changes in general dimensions and form we will use the present M. C. B. axle and wheel but more of them.

Is there not, however, another lesson that we may learn from our passenger car equipment? When the question of automatic brakes for freight cars began to be agitated a great impulse was given to all kinds of patented mechanical devices for stopping single cars and cars long trains. For a time we apparently lost sight of the fact that we had been using automatic brakes of a particular type for years. A careful and expensive investigation of the matter has resulted in bringing us back to the continuous automatic type that we have been so familiar with under our passenger equipment. Still more instructive is the history and development of the Master Car Builders' automatic freight-car coupler. After spending large sums of money over all kinds of devices, we have finally come back to one of our vertical hook types that formerly superseded the link and pin and has been used quietly and successfully under passenger equipment for years. Can we not learn something more from our passenger car experience about heavy axles? We have already built heavier cars for passenger service than we are likely to for freight. The demands of our fast freight lines are making the services more and more alike. It used to be considered necessary, and the practice is still very general to keep passenger engines exclusively for passenger trains, and freight engines for freight trains. The loads of our passenger trains of late years, however, have increased so materially, and the speed of our fast freight trains have also so much accelerated that the two services are now in some cases almost alike both in tonnage and speed. On one of the Western divisions of the C., B. & Q. the similarity of the two services has become so apparent that we have pooled our fast through passenger and fast freight engines, a certain number of the engines hauling passenger trains in one direction and freight in the other. Could there be any more convincing proof of the growing similarity of the service?

Much stress in the discussion on axles is laid on the importance of having an ample bearing surface, so that there will be a maximum number of square inches to distribute the load over, making the bearing susceptible of better lubrication, and consequently having fewer hot boxes. To a novice it might appear as though the only danger from hot boxes was on account of surface pressure, and yet we all know better than this. Every master car builder is aware that a large per cent. of the hot boxes under our freight cars is the result of collar wear, and that this evil of hot boxes is not confined to surface pressure. Examine our scrapped brasses and see what proportion are worn out from end pressure and what proportion from surface pressure. Examine our scrapped axles and see how many are condemned for collar wear. It has been urged by some that axles will not pass through the successive gradations of 60, 50, and 40,000 pound capacity service on account of the collar; that there will be little collar left after the first service imposed is accomplished. Could there be any stronger argument advanced for the necessity of a modification in lieu of the collar? Acknowledging that the collar has been productive of much bad work with our 40,000-lb. cars,

what endeavors have been made to meet the increased end thrust that certainly will be produced with 50,000 and 60,000-lb. cars? Absolutely nothing so far as recommendations are concerned. The design represented in fig. 1 does not show any additional provisions, nor do those shown in figs. 2 or 3. Many of our Master Mechanics will recollect the annoyance from collar wear in crank pins and how successful the results are where it has been possible to do away with the collar. There is hardly a railroad in the country that does not have cars in its passenger trains with collarless axles, and while there are difficulties in the way of adapting it to freight car service, owing to the construction of the freight truck, it does seem to the writer that it behooves each master car builder in the interests of the road he represents, to be giving the matter consideration, and at least to be making some tests and experiments with a few cars to determine what modifications in trucks may be necessary.

There has been a reason for doing away with the collars on our locomotive crank pins. There has been a reason for doing away with collars on so many of our passenger cars, and before car builders get themselves too heavily loaded with collar axles for freight cars of heavy capacity they will do well to consider whether the same evil does not exist in freight axles and the same remedy apply.

In conclusion, we are aware that by our failure to submit

a design of such proportion and form of axle as we would recommend, we leave ourselves open to considerable criticism. As stated, however, at the beginning of the paper, we have no intention to commit ourselves to any particular figures or form at this writing; to do so would only embarrass the other members of our committee, and forestall any interest in our report to the parent club. The object of the paper will be accomplished if, by bringing some phases of the question before you, we renew some interest in the topic and provoke all members of the Master Car-Builders' Association to send in prompt replies to the circular of inquiry the axle committee have prepared, and which will be issued this week to each member.

Tender Trucks of Locomotives—Western Railway Club.

At the meeting of the Western Railway Club on Feb. 19, Mr. Hickey, M. M., Milwaukee, Lake Shore & Western, read the following paper:

Discussions of the parts of the tender have been few and far between. Its history is unwritten save its record in the book of hot boxes and flange worn wheels. My object at this time is not to deal with the construction of frame or capacity of water-tank of the tender, the trucks on which it is carried being the subject under consideration; but it is a well-known fact that we cannot deal intelligently with the foundation without being somewhat informed of the weight of the superstructure. One of the definitions of the word tender given by Webster is a small vessel employed to attend a larger one for supplying her with stores or other supplies. If this had reference to railroad tenders, the size of many recently constructed would point to the belief that the words quoted in the definition should be reversed, and instead should read a larger vessel employed for supplying stores and other supplies to a smaller one. Many tenders lately built have a coal space capable of receiving seven tons, and a tank capacity approaching 3,800 gallons. Here is a combined weight of coal and water of over 45,600 lbs. The weight of tank and tender frame capable of sustaining this load will not be less than 17,900 lbs., plus 45,600 lbs., equals 63,500 lbs. To carry this load a pair of trucks built of the ordinary pattern will weigh not less than 12,000 lbs., which amount added to 63,000 lbs. gives a total weight of tender, when loaded, including trucks, of 75,500 lbs. Deducting from the last-named figures the weight of eight wheels and four axles which approximately will weigh 6,400 lbs., we have left a weight of 69,100 lbs., for which we must provide wheels and axles. Assuming that we have trucks of eight wheels, each wheel must bear a load of 8,637 lbs., and if we use M. C. B. axles with $26\frac{1}{4}$ square inch journal bearing, we get about 329 lbs. weight per square inch of bearing surface. With ordinary lubricants, I have several times experienced difficulty with bearings running hot when the weight exceeded 300 lbs. per square inch of contact, and in order to reduce the weight per square inch of bearing, in this case we have but to increase the diameter of journal from $3\frac{3}{4}$ to 4 inches, which will give a pressure of about 309 lbs. per square inch. When the weight per wheel is above 7,500 lbs. and not exceeding 8,500 lbs., axles having dimensions of the M. C. B. standard in all except an increase in diameter of journal to four inches, will render very satisfactory service. This change can be made without disturbing the dimensions of the oil-box, brass or other attachments, and as it adds to the serviceable period of the axle, it would seem to be a durable change, even under the lightest conditions of load mentioned above. Much less trouble from heating of journals will be experienced if in reaching dimensions, those dimensions are not based solely on their resistance to fracture under the meditated load, but they should be made so large that the pressure they must bear will be distributed over so much surface, that the pressure per square inch of bearing will not exceed the figure above given, thus making good lubrication much less difficult. Journal bearings containing a composition of $6\frac{1}{2}$ lbs. of copper to one of tin and well-fitted to journals have given excellent satisfaction in tender trucks. Of course the success or failure of running a truck journal depends largely upon the character of its oil box; the latter should have ample space for oil and waste, and be provided with well fitting lids to prevent the entrance of dust at that point, and should by all means be supplied with large well fitting and elastic dust guards at the back, for the double purpose of preventing loss of oil and excluding dust from the boxes. A lack of appreciation of these facts causes annoyance and delay to trains and much vexation from hot boxes, and any increased cost caused by giving the matter strict attention will be amply justified by the reduction in cost of lubricants alone.

The character of wheels best suited to tender service depends upon the weight per wheel and speed required. For fast passenger service a steel tired wheel about 36 in. in diameter is, without doubt, the most desirable, in that it is perhaps the safest; but for a load per wheel up to 9,000 lbs. and with moderate speed, a good cast wheel 33 in. in diameter, having the metal so placed in its formation that its strength at all parts will be proportionate to the strains it is intended to bear. Much is said and written about its treatment in casting and the quality of material used in cast-iron wheels, and as both elements are of vital importance to the character of the wheel, agitation of the parts is highly important, but next to having a good quality of metal, the necessary amount, and a proper distribution of it, are the most essential elements. If it is practically determined that a wheel is weak at a certain point, it should be strengthened at such point by an increase of metal, and so on at other points, until it has assumed proportions capable of withstanding not alone the strains and shocks that are brought to bear upon it, but have left a reasonable margin of safety. Limiting the weight of a wheel without taking other matters into account is limiting its strength, and I venture to say that as many failures to cast-iron wheels are due to scarcity and improper distribution of the metal they contain, as from any other cause. Wheels 33 in. in diameter, weighing about 550 lbs., have for years given fair satisfaction under a load per wheel not exceeding 7,000 lbs. We have increased the load to 9,000 lbs. per wheels and to meet this increased load we have added barely 50 lbs. to the weight of wheel; in other words, we have increased the load about 33 per cent., while the wheel to bear the load (that from the first had no greater margin of safety than was necessary) has been increased in weight but an amount less than 10 per cent. I have always believed that the running gear of rolling stock should be constructed of such strength and with such intelligence as to give it a high factor of safety. The better this part of the machine is constructed the cheaper it will be in the end. I have felt especially that if any good work is necessary anywhere it is in the running gear; if the element of cheapness must enter the construction, let it be placed at some other point.

A tender truck should have constitutional qualities as perfect as that used to carry the front of a locomotive; and should have vertical and lateral bracings that would at all times insure a square and plumb position of the frame and its attachments. To its frame should be attached suitable

pedestals, forming jaws, the centres of which should be equal distance from the centre of bearing. These jaws to enter corresponding ways on the oil-boxes for the purpose of permitting a vertical movement of the parts. The truck body should rest on springs which in turn should bear on equalizers introduced for the purpose of conducting equal strains to the journal bearings. Its parts should be planned to fit and reamed holes and turned bolts should enter its construction. The truck bolster should have sufficient stiffness to bear with ease the maximum strains brought to bear upon it by the tender and its load. From my observation and experience with many trucks of different designs, I should advocate centre bearing and rigid bolster for all, with side bearings only for the purpose of meeting any undue lateral rolling action of the tender body. All roads should seek to establish a uniform and interchangeable tender truck, and this with having both trucks of the same tender alike and interchangeable will be found of greater advantage than the much advocated policy of interchange with car trucks. It is difficult to see why locomotive tenders should rest on their trucks in any manner different from other railroad vehicles, yet how often we see the tenders of many beautiful and well proportioned locomotives carried on four side bearings resting on monuments of bar steel, usually called springs. Such trucks have no central connection with the body other than a pin placed for the purpose of retaining body and trucks in central position. Were we to see a car body attached to, and moved on its trucks in this manner, we would entertain serious doubts about its passing safely over the first curve on its route, and readily condemn it as being unworthy of the mechanical skill of this age.

I had hoped to present for your criticism drawings of various styles of trucks, together with a sketch showing a design of tender truck in accord with modern ideas, but from a pressure of other duties I was unable to complete them.

TECHNICAL.

Locomotive Building.

The Schenectady Locomotive Works have nearly completed seven locomotives for the Duluth & Iron Range road. The works have recently completed a number of locomotives for the Charleston, Cincinnati & Chicago, and will soon begin work on a new order from that road.

The Vicksburg & Meridian has placed an order with the Baldwin Locomotive Works, of Philadelphia, for three new engines.

The Rhode Island Locomotive Works has a contract for 12 engines for the Kings County Elevated Railroad of Brooklyn.

The Central Pacific last week received eight 12-wheel locomotives from the Schenectady Locomotive Works, and several more are to be delivered early in the spring.

Car Notes.

The Erie Car Works, limited, of Erie, Pa., have just closed a contract for 150 platform flat cars, for the Sinnemahoning road of Pennsylvania.

The Chesapeake & Ohio is now receiving daily large numbers of freight cars from the Indianapolis Car Manufacturing Co., the Pullman Car Co., the Barney & Smith Manufacturing Co., of Dayton, O., and the Esnig Manufacturing Co., of Huntington, W. Va. The cars are part of an order for 2,000 recently placed with these companies.

The Cairo, Vincennes & Chicago has just put in service six passenger cars.

The United States Rolling stock Co. is building a number of 60,000-lb. platform cars for the Jeffersonville, Madison & Indianapolis road. The cars are fitted with the American continuous draw-bar.

The Haskell & Barker Car Co., of Michigan City, Ind., is building 270 new ore cars for the Duluth & Iron Range. These cars are 4 ft. shorter than the cars heretofore used on this road, but they are of the same carrying capacity as the old cars, and are especially adapted to the handling of the soft ores of Northern Michigan. The Pullman Palace Car Co. is building for the same road at its shops at Pullman a handsome officer's car.

The Muskegon Car Co., has recently completed 10 Zimmerman refrigerator cars for a San Antonio brewery company. Mr. H. L. Cooper, who was formerly Superintendent of Motive Power of the Lake Erie & Western, is now General Superintendent of the car company.

The Jackson & Sharp Co., of Wilmington, Del., last week completed a number of new passenger cars for the Charleston, Cincinnati & Chicago road.

The Cleveland & Canton is now receiving eight coal cars daily of the order for 100 placed some time ago.

James G. Brill & Co., Philadelphia, have been awarded a contract for building a number of cable cars for a street railroad in St. Louis.

The Kansas City, Fort Scott & Memphis last week received 125 box cars from the Pullman Car Co. This is part of a contract placed last fall with the Pullman Co., for 300 cars.

Bridge Notes.

Plans have been made for a new five-span steel bridge to be built over the railroad tracks at Greenbush, N. Y. The bridge will be 670 ft. long and it is estimated will cost over \$75,000.

A new iron bridge is now being built at Waterford, N. Y.

The Sullivan County road, operated by the Connecticut River, has contracted with the Boston Bridge works for the erection of a single track, riveted lattice iron bridge, 550 ft. in length, across the Connecticut River at Windsor, Vermont. It is to be completed by July 1.

The Canadian Government is calling for tenders for the construction of a bridge in connection with the Cape Breton road, at the Grand Narrows, Cape Breton. Tenders will be received by the Railways Department at Ottawa till March 6. Plans and specifications may be seen at Ottawa, where forms of tender may be obtained.

Franklin County, Ky., will shortly begin constructing the new iron bridge across Kentucky River at Frankfort.

In accordance with orders from the Secretary of War, the Louisville & Nashville will at once proceed to furnish the bridge across Kentucky River at Frankfort, Ky., with a draw.

The King Bridge Co., of Cleveland, O., has just finished an iron bridge across Pup Creek, in Daviess County, Ky., at a cost of \$4,075, and the contract was last week given the same company to build a similar structure across Wayne Creek, in the same county, at a cost not to exceed \$3,000.

The Lynchburg & Durham has received bids for the construction of an iron or combination bridge over Staunton River, on the line of the road in Virginia.

An iron bridge is to be built at South Barre, Vt., to take the place of a wooden one, recently burned.

The commissioners of Shawnee County, Kan., are author-

ized by a bill introduced into the state legislature to issue bonds to the amount of \$350,000 to build a bridge over the Kansas River on Kansas avenue, Topeka. A bill has also been introduced in the legislature to authorize the commissioners of Wyandotte County to construct a bridge over the Kansas River at Kansas City at a cost not to exceed \$50,000, and to issue bonds to that amount to pay for the bridge.

William Reid and others have organized the Portland & Willamette Valley Railway Bridge Co., at Portland, Ore., with a capital stock of \$250,000, to construct a bridge over the Willamette River between Marion and Yamhill counties near Ray's Landing.

The Kansas City Bridge & Iron Co. has been awarded the contract for building the viaduct over the Union Pacific and Missouri Pacific tracks in Kansas City, Kan.

The Oakland Bridge Co. has just completed a new bridge over the Salinas River at Hilltown, Cal. The bridge cost about \$35,000, and has two longer spans than any other bridge on the Pacific coast. Three other bridges are now building in Monterey County.

The Edge Moor Bridge Co. has been awarded the contract for erecting the eight iron bridges on the Lincoln Park & Charlotte road.

At a special election held in La Crosse, Wis., Feb. 12, to vote on the proposition to issue city bonds to the amount of \$70,000 for building a wagon bridge across the Mississippi River over two-thirds of the votes cast were in favor of issuing the bonds.

Manufacturing and Business.

The Ashton Valve Company, Boston, has established a branch office at 92 Liberty street, New York, in charge of Mr. Charles H. Buckalew, long favorably known as United States Steamboat Inspector of the New York district. Mr. Buckalew is well equipped for his new duties by his years of observation of the action of the Ashton Pop Safety Valves on stationary and marine boilers.

The eighth annual meeting of the Burton Stock Car Co. was held in Boston, Feb. 12, 76,280 shares being represented. The following were elected directors for the ensuing year: Joseph C. Moore, Edward Spalding, Ezra H. Winchester, Virgil C. Gilman, Frank Jones, Charles F. Adams, J. Oak Davidson, George D. Burton, Charles A. Sinclair, William S. Reed, James P. Cook, Murray V. Livingston, Charles Howard. At a subsequent meeting of the directors these officers were chosen: President, Joseph C. Moore; Vice-President, Charles A. Sinclair; Treasurer, Charles Howard; Clerk, Clarence Hale. The company's assets amounted to \$2,890,000, consisting of cars, plant, etc.

The Morgan Engineering Co., of Alliance, O., expects to soon put an electric crane on the market, and is also making considerable additions to its works to meet the demand of the increasing business.

The Puget Sound Creosoting Co. is erecting a creosoting plant three miles north of Seattle at a cost of about \$325,000. Seven corrugated iron buildings are being built, and there will also be four steam pumps with a capacity of from 450 to 800 gallons per minute. The buildings will be lighted by electric lights. The machinery has been ordered at Richmond, Va.

Lodge, Davis & Co., manufacturers of iron and brass working machinery, of Cincinnati, O., will on March 1 open a branch office at Chicago, with Mr. E. D. Goodwin as Manager. Mr. Goodwin has long been connected with the home office.

The Pittsburgh & Lake Erie has recently ordered Ferguson balanced valves to equip five locomotives. The order was given after a long and thorough test. The valves are made by James Ferguson, of Bridgewater, Mass.

H. B. Griffin & Co., of Bainbridge, Ga., and E. B. Waters & Co., of Butler, Ga., have each purchased a McFarland tracklaying apparatus.

The Jonson Foundry & Machine Co. of New York has a contract with the Delaware, Lakawanna & Western to erect crossing gates in East Orange, N. J., with arms of unusual length.

The National Tube Works Co., of McKeesport, Pa., recently ordered a dozen large sized Curtis balanced steam traps, and other large orders have recently been received from various parts of the country.

The Northwestern Contracting Co. has been organized in Chicago and will do a general contracting business, including railroad grading, masonry and station building. C. J. Lantry is President and B. S. Crocker is Consulting Engineer. The office of the company is at 913 Insurance Exchange building, Chicago.

The Hill Clutch Works, at Cincinnati, O., have recently received orders for their clutch, pulley and couplings from the Lehigh Valley Railroad, Fitchburg Steam Engine Co., and many other companies in the Eastern States.

The Wason Manufacturing Co., Brightwood, Mass., has chosen officers as follows: President, George C. Fisk; Treasurer, H. S. Hyde; Directors, these and H. Pierson, L. C. Hyde and C. A. Fisk.

Iron and Steel.

It is expected to have the new plant of the Union Steel & Iron Co., at St. Joseph, Mo., completed early next May. M. V. Smith, of Pittsburgh, is Consulting Engineer.

The Henderson Steel Works, at Birmingham, Ala., are now out of blast for the purpose of enlarging the plant, which has lately been making a daily output of about 6 tons of steel. The foundry and machine shops are full of orders.

The Aetna Machine Co., of Warren, O., has recently received a contract to build a 600 h. p. engine for the American Wire Nail Co., of Covington, Ky. The company, as already announced, is also building a 500 h. p. engine for Morris Sellers & Co., of Chicago, and one of 400 h. p. for the New Albany Forge & Rolling Mill Co.

The Duquesne Forge Co., of Pittsburgh, has been organized by R. S. Smith, John Bissell and others, and has purchased the plant of the Miller Forge Co., Limited, which is located at Rankin Station, on the Baltimore & Ohio, near Pittsburgh. It is intended to make extensive improvements in the works and some new buildings will be erected, and new machinery put in.

The Warren Steel & Iron Co., of Warren, O., has closed down its works for an indefinite period. It is stated that an arrangement has been made with the Trumbull Iron Co., of Girard, by which the two companies will be consolidated. F. Bishop, Superintendent, has resigned.

The Milton Manufacturing Co. is refitting its rolling mill at Milton, Pa., and is putting in nut and washer machinery.

The rail mill of the Cleveland Rolling Mill Co., at Cleveland, O., has been started up, the men accepting a reduction of wages.

The plant of the Cartwright Iron & Steel Co., formerly known as the Alikanna Rolling Mills, at Steubenville, O., is being extensively improved and will shortly be put in operation. The product will be taken by the National Tube Works Co., of McKeesport, Pa.

Early in January the Steel Car Wheel Co., of Boston, started a small Bessemer plant, which was built for it last year by J. P. Witherow, of Pittsburgh. The plant consists of a 3-ton tilting converter. The product will be a metal patented by the company, and will be chiefly used in making car wheels.

The Pittsburgh Construction Co. has been re-organized, and M. P. Canfield and R. A. McKean, of Pittsburgh, are now the principal officers of the company. They will engage in a general construction and engineering business, and will construct Smith's regenerative gas furnaces and producers under a license granted them by Mr. M. V. Smith.

The Rail Market.

Steel Rails.—The report of the Board of Control to Feb. 1, shows that the sales by the mills to that date aggregated 494,441 tons this year, against 394,897 tons reported up to the same time a year ago. The *Iron Age* notes that the Eastern mills, including the Pennsylvania, Bethlehem and the two Scranton mills, reports sales of 213,978 tons; the Pittsburgh district, including Edgar Thomson and Cambria, have 173,640 tons. The Allegheny Bessemer, which does not report, may carry this to 200,000 tons. The three Chicago mills, the North Chicago, Union and Joliet, have, together, 108,823 tons. The same Eastern mills shipped last year 471,747 tons. The two Western Pennsylvania mills shipped 221,309 tons, and the Chicago group 442,636 tons. The same paper also gives the following list as embracing all the sales upward of 10,000 tons thus far: Pennsylvania, 51,148 tons; Union Pacific, 17,000; Erie, 20,000; Pacific Improvement Co., 10,000; Alabama Terminal, 14,123; Chicago, Burlington & Quincy, 11,250; Lackawanna, 10,000; Fort Worth & Rio Grande, 10,000; M. Kennedy, 13,558; S. Kneeland, 12,335; Lake Shore, 12,000; Lehigh Valley, 10,502; Lyndburg & Dunham, 10,000; Missouri, Kansas & Texas, 12,990, and Missouri Pacific, 15,000 tons. The Eastern mills quote \$27; Chicago quotations are \$30@ \$30.50, and Pittsburgh, \$28@ \$28.20.

Old Rails.—A sale of about 300 tons, for delivery at Norwich, Conn., at \$22 has been made.

Track Fastenings.—Quotations: Spikes, \$2@ \$2.10, and angles are \$1.80@ \$1.85.

Burning of Railroad Shops.

Early in the morning of Feb. 19, the machine-shops and round-house of the Cincinnati, Indianapolis, St. Louis & Chicago, at Sixth and Harriet streets, in Cincinnati, were destroyed by fire, causing a loss of \$100,000. One of the approach spans of the Cincinnati Southern Railroad bridge was so warped by the heat that it will have to be replaced. It is said that the shops may be rebuilt at Covington, Ky., or Indianapolis.

Master Mechanics' Association.

The following circulars have been sent out to members:

Driver Brakes, etc.

1. How many locomotives of each class, viz., passenger, freight and switching, are equipped with driver brakes on the railroad with which you are connected?
2. Of the above, state in detail how many are operated by compressed air, by vacuum and by steam? Which gives the best results, and why?
3. Give in detail the number of engines of each class equipped with each style of brake, viz., the spread, the pull and the clasp. Which gives the best results, and why?
4. Are brake-shoes applied to all the driving wheels? If not, please say in what respect and to what extent deviation from this practice is followed, and if unsatisfactory wear of tires has resulted.
5. From your experience, under what circumstances do you recommend the use of the driver-brake in conjunction with train brake? Do you consider the driver-brake should be used in making every stop, or for emergencies only?
6. Do you consider the braking of engine truck wheels to be of sufficient importance to warrant the additional cost of equipment and maintenance?
7. With what different brake-shoes have you had experience? which do you recommend, and why? Please send drawing of same.
8. Please give results of experiments, if you have made any, showing the relative endurance of various kinds of brake-shoes, under similar conditions, also the effect of same on tires.
9. What ratio do you recommend between pressure of brake-shoe on tire and pressure of tire on rail?
10. What ratio do you recommend between pressure in pounds on each brake-shoe and the number of square inches of shoe in frictional contact with the tire?
11. How many engines of each class are there on your railroad equipped with the water brake?
12. What is the average cost of necessary material and labor fitting up this brake? Please supply blue print showing arrangement of same.
13. Under what circumstances do you recommend the use of this device?
14. Have any unsatisfactory effects upon machinery resulted from use of this brake? and, if so, how can they be obviated?
15. If you can give other information bearing on this subject, you are respectfully requested to give the benefit of same to the undersigned.

CHARLES BLACKWELL,
H. D. GORDON,
W. H. THOMAS,

Committee.

Answers to circulars to be sent to Mr. Charles Blackwell, Engineer of Machinery, Central Georgia Railroad, Savannah, Georgia.

Boiler Covering.

1. What form of boiler covering do you consider best to use?
2. Give your reasons for the preference.
3. If you use asbestos or other composite covering, please say how it compares with wood in first cost and in cost of maintenance.
4. Do you find that composite covering causes corrosion of sheets or of jacketing?
5. Do you find that composite covering inconveniently interferes with the examination of boilers?
6. What is your manner of putting on composite covering?
7. Please give your estimate of the comparative value of wood and composite boiler covering as preventive of heat radiation.
8. Please give any other information you may have concerning different forms of boiler covering.

G. W. STEVENS,
JOHN MACKENZIE,
T. B. TWOMBLY,

Committee.

Send replies to G. W. Stevens, Superintendent Motive Power, Lake Shore & Michigan Southern Railway, Cleveland, O.

Proportion of Flue and Grate Area.

The following questions refer to boilers using bituminous coal:

1. Have you, in renewing boiler tube plates, or in building a series of new boilers, altered the number or size of

flues, or altered the clearance space between them, without altering the length of flue or altering any other part of the boiler or engine?

If so, can you give comparative results, either in fuel, consumed for work done or in water evaporated, stating the exact change or variation you made which produced such results? This information should be given in answering any of the questions; and in quoting results, endeavor to distinguish between higher evaporative power ("free steaming") and increased economy in evaporation (more water boiled off per lb. of fuel).

2. Have you made any such change, keeping the flue-heating surface the same in total amount, but putting in flues of larger diameter, so as to increase the gas opening through the flues; or made any such change, still keeping the flue-heating surface the same, but putting in flues of smaller diameter, thus decreasing the gas opening through the flues?
3. Have you made any such changes, either shortening or lengthening the flues, but keeping the total flue-heating surface the same?

4. Do you know of any instance in which reducing the flue-heating surface, or reducing the gas opening through the flues, increased in any way the efficiency of the boiler?

5. Have you made any changes in the amount of grate surface without altering the boiler or engine at any other point? If so, with what result? If you have knowledge of any experiments of this kind carried out on other than locomotive boilers, kindly quote them also.

6. In designing or ordering locomotives, do you proportion the amount of grate surface simply to suit the quality of coal likely to be used, or do you believe—if the boiler is to be in its most effective condition—that the grate surface should bear some definite proportion to the flue-heating surface, or to the gas opening through the flues? If you proportion, give the ratios you use or would like to use.

7. Is it possible, within the narrow limits of deviation allowed in an ordinary locomotive, to give a boiler too large a grate surface?

A grate may be too long for the fireman to equally cover it with coal, or it may have too much air opening through it to suit certain qualities of fuel; but these points are not properly to be taken into a consideration of the question of absolute grate surface.

8. If to use a certain quality of fuel you have found it necessary to put at one end of the grate a solid "dead plate" or "drop plate," has such reduction of the effective grate area lessened the evaporative power or the economical efficiency of the boiler? In answering question 8, a note should be made as to whether, in making the change, the clearance between the firebars (air space) was altered.

9. Have you in any way improved a boiler by reducing the total grate surface, all other points remaining unchanged?

10. Are you familiar with any experiments tending to show that rapid combustion is, for steam purposes, more economical than slow combustion? If so, quote or refer to them, and say if you think the result is due to the higher temperature (commonly believed to accompany rapid combustion) transmitting a larger portion of its heat through the metal or to a more thorough burning of the fuel?

This matter has a close bearing on the whole subject, for, other things being equal, the smaller the grate the more rapid is the combustion.

11. What is the present limit, in locomotive practice, to the number of pounds of good clean coal that can be fully burnt per hour per square foot of grate surface?

12. Are there any facts from which it may be reasonably inferred that this limit will in the near future be exceeded?

13. How many pounds of water (from and at 212°) will 1 lb. of good coal evaporate when the grate is thus working up to its highest limit.

14. What is the minimum amount of flue surface per square foot of grate that will do this high duty?

J. DAVIS BARNETT,
F. W. DEAN,
PHILIP WALLIS,

Committee.

Replies to be sent to J. Davis Barnett, Grand Trunk Railway, Stratford, Ont., Canada.

The Johnston Electric Train Signal.

The Boston, Revere Beach & Lynn road is having its cars equipped with the Johnston electric signal. This signal differs essentially from any device of its class in many important details. The connecting wires, being thoroughly insulated, are woven into a cable about the size of the ordinary bell rope. This cable is carried through rings in the cars over the windows, or may be run through the hangers as in the case of the bell rope. The push button is a globular shaped device encircling the cable, and by pressing the button the contact is made, ringing the bell in the cab. At the same time the motion of the two points of contact polishes them and prevents the current being broken by corrosion. The button being sealed is water and dust proof. There are five of these buttons in the car and one upon each platform. Should the train break apart the circuit is closed automatically, causing the bell in the cab to ring until shut off. The coupler is a simple and ingenious device, the two points of contact being latch-shaped, with a cylindrical covering of wood, dovetailed together. They are easily connected and will uncouple automatically.

One train is already equipped, and during a recent trial a representative of the *Railroad Gazette* tested the signal several times on the run from Boston to Lynn. Superintendent Hammond intends when the cars are all equipped to issue a code of signals for the use of conductors and engineers. This will doubtless be of great use, particularly in the summer, as the road carries large numbers of excursionists to the resorts along the line, and the stations are near together.

The signal may also be applied to freight trains, and is so constructed that in case the train breaks apart a bell will be rung automatically both in the engine and caboose.

The signal is manufactured by the Johnston Electric Train Signal Co., 56 Equitable Building, Boston, from whom further information may be obtained.

Sprague Electric Transfer Tables.

The Sprague Electric Railway & Motor Co. is making the driving plant for a transfer table for the Philadelphia & Reading. This is the third transfer table that this company has equipped. The first was put in at Aurora for the Chicago, Burlington & Quincy about nine months ago, and the second will soon be in operation at the Pennsylvania shops, Altoona.

A Submarine Torpedo Boat.

Bids were opened at the Navy Department last week for the construction of a submarine torpedo boat. The Columbian Iron Works, of Baltimore, offered to build a vessel of 90 tons, under three bids, as follows: For \$150,000 and guaranteeing a speed of 12 knots on the surface and 9 knots submerged, with 19 hours' power endurance on the surface and 1 hour submerged; \$115,000, guaranteeing 10 knots on the surface and 8 hours submerged and 15 hours' endurance on the surface, and \$100,000, guaranteeing 9 hours on the surface and 7 hours submerged.

George C. Baker, of Des Moines, Ia., offered to construct a vessel of 40 tons, with no guarantee, except that she could be

handled easily, either on the surface or submerged. The plans submitted by the Columbian Iron Works show a boat evidently a modification of the Holland boat, on which the Cramps bid, the first time the department advertised. From a hasty examination of the bid and plans, the Secretary of the Navy believes the bid of the Columbian Works will be accepted.

Dynamite Guns.

The Secretary of War has awarded the contract for the construction of seven dynamite guns, with all accessories, including ammunition, machinery for operating, etc., to the Pneumatic Dynamite Gun Co., of New York, at their bid of \$395,500. The guns are to be delivered, ready for service, within eight months from the date of contract. They are to be located as follows: One 8-in. and two 15-in. guns at Sandy Hook, N. J.; two 15-in. at Fort Schuyler, New York, and two 15-in., at Fort Warren, Boston.

The Shops at Ludlow.

The new shops of the Cincinnati, New Orleans & Texas Pacific which have just been completed at Ludlow, Ky., cover two and one-third acres of land. They are built in a solid block, covering a space 100x440 ft.; the boiler, machine and blacksmith shops, under one roof of 100 ft. span, are divided from each other by brick fire walls. At the east end of the main building, and divided from it by a party wall, are the boiler and engine-rooms, 30 by 50 ft. each, under one roof; adjoining these are the brass and tin shops, 30 by 45 ft. each, under another roof. In front of the machine and boiler shops is the transfer-table pit, 220 ft. long. The buildings are of brick, with slate roof, stone trimmings and galvanized iron cornice. They are heated by steam and lighted by electricity.

A "Safety" Heating and Lighting Exhibit.

On Monday of this week an exhibit was made in Chicago, at the Dearborn station, of the car heating and lighting devices of the New York Safety Car Heating and Lighting Co. The Pullman car "Normandy" was received there Saturday. It had been fitted up in New York and arrived in Chicago, after a run of 900 miles, with the devices all in full operation, in good condition. The Pintsch gas-lights had been burning for ten hours up to the time of the arrival of the car in Chicago. A private exhibit was made Sunday, and, after the exhibit on Monday there still remained sufficient gas in the tanks to supply the lights during a night run to New York. Each car has 44 lights, which are nearly equal to the incandescent electric light in brilliancy. One of the great advantages of this light is the removal of all obstructions to illumination from below the burners.

Owing to the non-arrival of the locomotive to heat the car at the specified time, no exhibit could be made of the actual operation of the heating devices, but it was fully explained by Mr. H. A. Little, who is in charge of the Western business. The heating engine arrived in time, however, to show the rapidity with which steam passes through the piping and heating drum.

Sprague Motors for the Pennsylvania.

The Pennsylvania Railroad has contracted for the equipment of its street railroads in Atlantic City, N. J., with the Sprague motors. Six cars will be built at once, each capable of hauling a second car, and eight more will be built later.

St. Mary's Falls Canal Lock.

The contract for building a new lock at the St. Mary's Falls Canal has been awarded to Collins & Farwell. The contract involves about 131,000 cubic yards of earth excavation and 108,000 cubic yards of stone and a considerable amount of masonry. The total cost is estimated at \$220,000. The lowest bids were 43 cents per cubic yard of earth excavation, \$1.33 for rock, and \$3.95 for masonry.

The New Watervliet Arsenal.

Chief Engineer Anthony Victorin, United States Ordnance Department, has practically completed the working plan for the new \$700,000 great gun factory at the Watervliet Arsenal, and the contract will soon be ready for letting. The factory is to be erected about in the centre of the armory reservation, midway between the Delaware & Hudson Railroad in the rear and the Hudson River in front, and contiguous to the Erie Canal, which traverses the lower portions of the grounds at West Troy. A branch will run from the Delaware & Hudson main track through the middle of the shop, across the canal by a new bridge, to the river front.

The gun shop will be 963 ft. long, with a width of 128 ft. on the north wing and 158 ft. on the south. Each wing is to be 400 ft. long, and between them will be a central structure covering the rest of the room, to hold two 200-horsepower engines—one for service in each wing—office, tool-room, machinery for assembling the guns, and a shrinkage pit 50 ft. deep, with three levels, 20, 35 and 50 ft. below the ground.

The north wing is to be utilized for the construction of cannon from 8 to 12 in. bore. It will accommodate 15 lathes, ranging from 70 to 105 ft. in length, all specially constructed. Manufacturers who bid will be expected to follow out the general design, submitting their own improvements. The lathes in the annexes must largely be newly designed for economical handling of the hoops and breech mechanisms. Overhead will run two 30-ton traveling cranes, and 30-ton cranes will run on suspended tracks in the annexes. The lift of the large cranes will be 35 ft. from the floor. The building will be a single story throughout, of a maximum height of 75 ft. It will be of brick and iron, covered with slate.

The south wing will contain a like number of lathes, but will be given over wholly to the manufacture of 16-in. bore breech-loading rifles. Here Mr. Victorin believes an average of 20 can be made in a year, or 25 at a pinch. The same production of 8, 10 and 12-in. guns is allowed for the south wing.

It will take two years to complete the shop for which the plans are now ready—that is, the centre and north wing. The south wing could be built as quickly if there was enough money.

The gun steel comes to Watervliet from the Bethlehem Iron Co. rough forged, oil-tempered and annealed. The work of finishing has been going on for a year at Watervliet under adverse circumstances, but with excellent results.—*Iron Age*.

Shipbuilding.

Shipbuilding in this country exhibits much activity, and so great is the demand upon the resources of various shipbuilding yards that it is understood that the United States & Brazil Mail Steamship Co. is unable to procure bids upon two steamers which it wants, unless willing to wait two years for them to be finished. The ships negotiated for include one for the Mallory Steamship Co., and two for the New York & Cuba Mail Steamship Co., which will be built at Roach's yard, one for the Morgan line and two for the Red "D" line, contracted for at William Cramp & Son's, and a steel steamer, of 5,000 tons displacement, which a Scotch firm is building for the Pacific Mail Steamship Co. The steamers contracted for in this country range from 305 to 350 ft. in length, and their equipment will include triple-expansion engines and all of the modern improvements.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The Railroad Commissioners of Massachusetts have just issued two decisions, which illustrate two important principles. The first case is that in which they order the New York, New Haven & Hartford to establish a station at Whately and to stop two trains each way per day at that place. The attorney for the road stated at the hearing that the business of the town would not be sufficient to pay for the baggage master's uniform, and the road has postponed the establishment of a station for that reason. Moreover, the Connecticut River road runs parallel at this point, and furnishes very good accommodations for the town. The road, originally the New Haven & Northampton, was built some eight years ago, and the town appealed to the Railroad Commissioners in 1886. The Commissioners then issued a recommendation, substantially the same as that now given, but it was not complied with, and the Legislature subsequently passed an act directing the Commissioners to issue a mandatory order.

The present decision simply re-affirms that of 1886. The railroad company has been given right of way through the middle of the town, but it has no station whatever within its limits. Its trains make connections to certain towns affording facilities which the older road does not give. The agent of the New Haven & Northampton, in buying land for right of way and station purposes, made promises that a station would be established, and thereby induced land owners to make moderate prices; it was in evidence that this agent was not duly authorized by the President of the road to offer such inducements, but the board nevertheless gives the fact some weight. The original decision (Report, 1887, page 99) states the equities of the case in very clear language. "Even if it were proved that the road ought never to have been built, it would not follow that it ought not to be put to every use of which it is capable. * * * The reasonable accommodation of the people on the route is part of the price to be paid for the franchises of a railroad."

The other decision concerns the location of station buildings at Hadley, on the Central Massachusetts. There was a misunderstanding between the railroad company and the townspeople, and also rivalry between the residents on two parallel streets, which both crossed the railroad. Each party wished the station located directly at its own street. The commissions say that no station should be located in the immediate vicinity of a grade crossing. The location should always be at least 500 ft. away from such a place. In accordance with this view they decided that the station should be midway between the two streets, and they add that, if it shall be found that pedestrians walk upon the track as a short cut to the station from either street, the town must provide a foot-path adjacent to the railroad's right of way. In no event must people be encouraged or permitted to walk on the tracks. These principles are almost axiomatic, and are agreed to on all sides theoretically, but when it comes

to actual practice all interests are found to be bound by numerous draw-backs. Poor roads cannot afford to incur a single dollar of expense that can by any view of the case be termed unnecessary, and small country towns can scarcely be made to appreciate the wisdom of putting themselves to inconvenience in their daily intercourse with the railroad and to considerable expense for road building for the almost sole purpose of benefiting future generations. The contention of the rival streets at Hadley has apparently resulted in a compromise which is a decided gain, for if there had been only one crossing the Commissioners would probably not have been called in. It is to be hoped that the wise views of the Board may be brought to bear in many more cases of this kind.

An officer of the roadway department of the Boston & Albany writes us that the derailment on that road Dec. 27, reported recently in our accident record as "at a facing point switch," was not caused by the switch but by the dropping of a brake-beam, and that the derailment occurred before the switch was reached; and from another source we learn that the car belonged to another road. The incident is typical of a class that illustrates a common and troublesome phase of railroad experience. If this had been a Boston & Albany car, the car department would not have been at all pleased to have the correction made, and our correspondent would perhaps not have mentioned it. A few months ago we reported a derailment of a passenger train where the road department and the transportation department contradicted each other in regard to the cause. And similar cases come up often. It is nearly always possible, however, and usually easy for the management to fix the responsibility in those cases, and to take measures which will help to avert accidents in the future. It is the cases like that which called out the correction of our accident report, which are almost without remedy. It will be admitted that the duty of borrowing only good cars is as binding as that of building or buying good ones. A \$7 wheel under a foreign car, loaded with 25 tons of coal or lumber, may any day pile up a wreck in front of a \$100,000 vestibule train; but the road which suffers can get no redress, and the M. C. B. rules for interchange do not cover the case. They do, however, adequately provide for good brake rigging, and if a car is received which is in this particular unfit to be run, the fault is with the inspection at interchange points. The frequency of such cases suggests that the inspection is not strict enough. Between his desire not to delay traffic and his duty to stop all cars that are not in running order, the position of the inspector is a hard one, and he needs all the back-bone that nature has given him, and all the moral support that he can get.

An Indianapolis superintendent is reported as having statistics to show that more persons are killed and injured at highway grade crossings in towns by slow trains than by fast ones. It is also stated that train accidents do not happen to fast trains in the same proportion as to others. But one may admit the facts as given and yet be unable to draw from them any conclusion of value. It is asserted that persons will look out more carefully when it is known that a fast train is due. But how are they to know that it is due? It is familiar to all railroad men that the killing of pedestrians and carriage riders by fast runners has been noticeable for years. Many trains had been run at high speed over portions of their journey for a great while before the present "flyers" became a regular thing; and casualties occurring when time was being made up seem—so far as recollection can determine—to have been disproportionately numerous. The experience of lines where nearly or quite all of the trains are fast cannot be said to justify the theory here put forth. Lines in Jersey City which are traveled every day by many trains running at high speed, have an unenviable record of fatal accidents of this kind. It is reasonable to suppose that fast passenger trains will have fewer general mishaps than slow ones. They have the best cars and engines and the best men; and all other branches of the business must stand out of their path. Freight on the Pacific roads have to clear the Golden Gate Special 30 minutes. Finally, fast trains are still so few compared with the total number of trains running that care must be exercised in drawing conclusions, whatever the statistics may seem to show. The total number of fatalities, including tramps and other trespassers, is undoubtedly proportional somewhat to the speed of trains, and we must still regard as pressing, the necessity of keeping people from walking on the track and of guarding or abolishing grade crossings. It is well to tell people to look out when a "cannon-ball" is to be fired through a town, but we can hardly fee

a substantial assurance that the chronic litigant who is constantly looking for an opportunity to get his leg broken in the vicinity of a railroad line will always hear the news; and he has the sympathy of the sovereign law makers of his town or county in any event. Barnum used to insert in the flaming announcements of his street parades a cool suggestion that ordinary people "would do well to get out of the way" about the time his cavalcade was due. But if Barnum had been under any real necessity of clearing the streets for his progress he would better have taken a less impudent method of securing compliance with his wishes. The same consideration is not wholly inapplicable to the railroad situation. The only way to make substantial progress in keeping people out of the way of trains lies in the adoption of methods which municipalities can be got to agree to.

Clerks are not the only persons who should deem it necessary to be good penmen. Even brakemen and firemen, who, it might at first be thought, could fill their places just as well without this qualification as with it, have need to pay particular attention to this matter. With the increasing attention now given to matters of discipline, reading and writing are likely to be given more prominence than heretofore in the selection of all employes, and the requirement that firemen and brakemen shall be made conversant with telegraphic train orders is more likely to spread than to be abolished. But beyond this, the practice of selecting engineers from the ranks of the firemen, and conductors from the brakemen, which is followed with more and more regularity year by year, is making officers increasingly careful in the selection of new men for the lower grades. If it is tolerably certain that a man engaged to-day for fireman will be wanted five years hence for a runner, it is much easier and in every way better to find out all his qualifications now than to wait until nearly time for promotion and then have to not only find out what he does know but to teach him many things which he doesn't know. We are led to these reflections just now by seeing a letter written by a fireman who seeks promotion to the other side of the cab. He has had experience as a runner in a former place, and the language and tone of his letter indicate a degree of intelligence that implies ample ability to guide a train and care for an engine; but his penmanship shows that he has made very little effort to become a legible writer, and none worth speaking of to make himself even a passable one. Reading is intimately connected with writing, and the impression is irresistible that one so slovenly in writing would be liable to make mistakes in reading train orders. Other things being equal, a fair penman would certainly be preferred over this man in case of promotion, by almost any examiner. The only legitimate use an engineer or conductor has for poor writing is for the purpose of studying it so as to enable him to accurately read carelessly written messages. Should not the superintendent make more systematic effort than he generally does to encourage men to improve themselves? It may seem like an unwarrantable assumption of the "paternal government" idea, but would not such encouragement, if made effective, result in a direct gain to the road? The night schools, technical training classes and similar features connected with the reading-rooms encouraged by railroad companies are excellent as far as they go, but men do not use them very freely. Mr. Vanderbilt, in his annual report of the Railroad Young Men's Christian Association of New York city, deplored the fact that the facilities for education and training afforded at the Madison avenue building, which are on a very generous scale, are so generally neglected. Benevolent expressions in public speeches and appropriations of lump sums containing three or four figures serve an excellent purpose in evidencing the right kind of spirit in the directors' hearts, but they do not always bring tangible results in the working efficiency of the men. Those who say that philanthropy and business, or sentiment and net earnings, have no connection with each other can still claim that little or nothing has been done to impair their reasoning. Why not tell men explicitly that improvement in penmanship, or theoretical knowledge of mechanics, or in general mental alertness, will positively count in making promotions?

The Powers of Railroad Associations.

The agreement of the trunk lines is nominally little more than an appendage to that of the western roads. It is not so widely heralded as the Inter-state Commerce Railway Association; but it may prove quite as important and well

worth discussing. To begin with it has been promptly signed with all appearance of general good will. It is extremely well drawn. It has the rare merit of arranging to do what can be done and not arranging to do what cannot be done. On the latter account it has been somewhat criticised, even by people who ought to know better. Such critics really object to the agreement because it recognizes existing facts, and deals with things as they are.

For instance, the agreement does not pretend to compel its members to accept the results of arbitration. It simply says that any member which refuses to abide by the final award shall withdraw from the association. This, says the critic, is a weak point. Yes, but it is a weak point in the situation, not in the agreement. It is a strong point in the agreement to recognize the weak point in the situation. There is no effective means of compelling a railroad to accept the results of an award which it does not like. It is desirable that there should be, but our legislators cannot be made to see it. Nor can our railroads, in default or in defiance of legal authority, do anything effective toward the accomplishment of that end. Under these circumstances they have a choice between two courses, either to pretend to have a power which does not exist, or to face the facts squarely. If the agreement is regarded as a means of restoring the temporary confidence of investors the former is doubtless the shrewder course. But if the object is to secure good railroad management the latter is a wiser as well as a more honest one. It is wiser, even from the point of view of the bankers themselves; for any temporary confidence on the part of the investors, if it proves to have been ill-founded, produces a severe reaction.

In the last resort, the only power which an association has for enforcing its decisions is the power of expelling a refractory member. If it pretends to more power, it really possesses less. It may postpone a solution of the trouble; but it does not remove or even palliate the real difficulty by such postponement. It simply keeps the facts concealed from the public a little longer than would otherwise be the case. If, on the other hand, the association offers the offending road the alternative of conformity or withdrawal, it puts the responsibility where it belongs. Instead of a confused mixture of charges and counter-charges, the public has the actual state of the case plainly before it. There is a road which will not accept the results of arbitration, and a law which will not give the association any power in the premises. Whoever is to blame, the association certainly is not.

The provisions with regard to suspected rate-cutting show the same careful adaptation to the facts of the case. When any complaint of this kind is made, the president of the company thus accused is personally responsible for making a full investigation. But if the complainant company is not satisfied with the results of such investigation, it has the right, under certain conditions, to make open reductions to meet the suspected cuts. At first sight, this seems at once cumbersome and ineffective. Yet it will be found, we think, that it is the only thing which can be done under present conditions. There are always, on every important railroad system, a great many minor irregularities with regard to rates, irregularities which do not very directly violate any law, and which are extremely hard to detect, because they arise from the discretionary power of individual agents. In themselves, they are perhaps trifling; but if one road practices them much more than another, they divert a good deal of traffic and are a fruitful source of rate wars. They are not so important in their direct effect on revenue as in their indirect consequences. The irregularities themselves will not stop till the Millennium; the practical problem is how to prevent the more serious consequences. The pooling system did this to some extent, because it removed the advantages to the road which practised the irregularities and thus avoided the suspicion that they were intentional. Now that pools are prohibited we have two courses open; either to demand a direct investigation of all the more serious cases, or to have secret rate cutting on one line met by open rate cutting on another.

To rely on the second means, to the exclusion of the first produces obviously bad financial results. To rely on the first, without the possibility of the second, is not always practicable. An outside complainant, even with the aid of the Inter-state Commerce Commission, cannot make his investigation effective. It must be made, in good faith, by the authorities of the suspected company. In the majority of cases, such an investigation would doubtless produce the desired results. But it will not always do so; and if the complainant road, when dissatisfied with the results of such an investigation, is not allowed to make open reductions,

it will either make secret cuts or withdraw from the association. Either of these effects would be worse than an open and guarded reduction in rates.

The present agreement provides for mild measures, as long as there is a chance for them to work, under the best conditions for their successful operation. If they fail, it saves as much as possible from the inevitable wreck. If the pooling clause of the western agreement (which is repeated by the trunk lines) can be made effective, the means here provided will be a decided help in its operation. Even if this proves impossible, they may amount to something. Mr. Fink seems to us to have made the very best of a bad situation.

The Compound or Double-Expansion Locomotive in American Service.

II.

It is expected when the compound locomotive is used, that, owing to the more economical use of steam, less steam will be required to do the same work, and, therefore, less volume of exhaust will pass through the exhaust nozzles at high speeds; it is further expected that a decrease in cylinder condensation will change the nature of the exhaust from a heavy vapor, containing much water in suspension, to a lighter vapor containing far less water. It has been predicted from the premise that the friction of the steam in passing through the nozzles and passages will be much reduced.

The greatest benefit that will probably be derived from the double expansion engine, when high pressure steam can be admitted to the low pressure cylinder, is the independence of the valve gear designs, which will allow the details of the link and other valve motion to be arranged in a manner best suited for high speeds, which is a condition exactly opposite to that under which such motions are now designed.

With regard to the reduction of cylinder condensation, by the use of double expansion locomotives, we are not without experience in this country. Several experiments have been made in laboratories, and, in practical use, the Westinghouse Machine Co. has been experimenting with the compound condensing stationary engine with and without the condenser attached. It has been found that there is a marked gain in the case of the simple double expansion without the condensers over the single expansion in one cylinder.

The results of various experimenters in the field of cylinder condensation go to show that not as much steam is condensed if the range of temperature in any one cylinder be reduced and the total range of temperature be divided between two or more cylinders. To illustrate, if one cylinder or one expansion be used, the temperature of the exhaust is not far from 212 degrees, the temperature of the entering steam at 160 lbs. pressure, is about 375 degrees, making a difference of 163 degrees between the temperature of the walls of the cylinder and that of the entering steam. This is a greater difference in temperature than would be apparent in passing from a room at 80 degrees Fahrenheit into a northwestern blizzard where the temperature was 40 degrees below zero. This sudden plunge of hot steam against cold cast iron takes place every time steam enters the cylinders, and the result is the condensation of a large portion of its volume. If, now, the range of temperature in one cylinder be reduced and the exhaust be kept at a temperature about midway between 212 and 275 degrees, it is found that far less condensation, in proportion to the difference of temperature, will take place. This fact, determined by experiment, led engineers to believe that a substitution of two or more cylinders, for the single cylinder, the total range of temperature in which is exactly the same as the range now taking place in one cylinder, will materially reduce the present losses, and this belief has led to the designs known as "triple" and "quadruple expansion engines," which have met with so much favor in marine service. It is stated, by marine engineers, that their engines are far more economical when using triple expansion without the use of a condenser, than when the expansion is allowed to take place wholly in one cylinder. In order to obtain still greater efficiency from triple and quadruple expansion engines, the pressure has been materially increased. The boiler pressure of locomotive engines is quite sufficient to admit of considerable economy as a result of multiple expansion. During the early trials of high pressure in marine service, the range of temperature was so great that immense quantities of water were condensed during the early part of the stroke in the high pressure cylinder, and it was said by observers, during such trials, that the water could be heard "swashing" about in the cylinder. A por-

tion of this water would re-evaporate in the low pressure cylinder, and this, to some extent, reduced the loss due to condensation. It is found that the large capacity of the second cylinder in the compound locomotive allows this re-evaporation to take place to a considerable extent.

The shape of a representative indicator card for a double expansion engine is shown in figs. 3 and 6. This is not the shape of the actual card taken from the locomotive; it is the combined card made up from

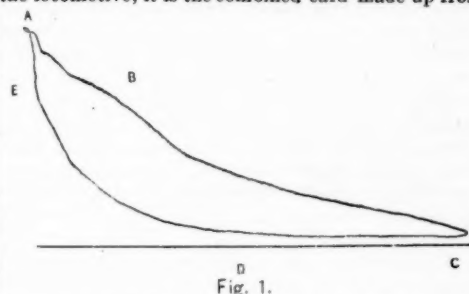


Fig. 1.

the actual cards taken from the high and low pressure cylinders independently. Fig. 4 shows the card taken from the low pressure cylinder, and fig. 5 that taken from the high pressure cylinder. The top portion of the card fig. 3 is the exact reproduction of fig. 5 drawn to a different scale; likewise the lower portion of the

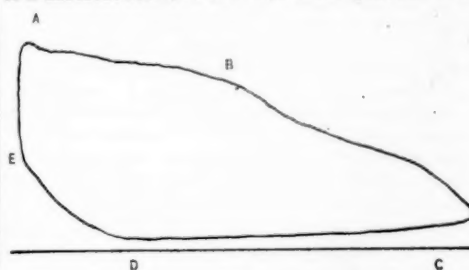


Fig. 2.

same card is an exact reproduction of fig. 4 drawn to the same scale as the upper portion of fig. 3. The radical difference in the action of the double expansion and the common single expansion locomotives at high speeds is best shown by a comparison of figs. 1 and 6.

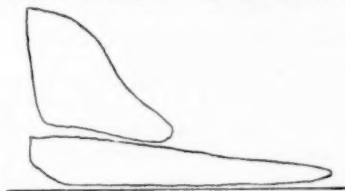


Fig. 3.

The speeds at which these cards were taken were 45 miles per hour for fig. 1, and 50 miles per hour for fig. 6. The comparison shows that although the admission line A B, the expansion line B C, and the back pressure line C D are slightly su-



Fig. 4.

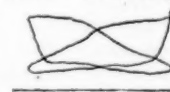


Fig. 5.

perior in fig. 6, yet the greatest advantage is obtained at the compression line D E. Fig. 6 is the ideal card for the single expansion engines, and one which we have been striving for years to obtain in a single cylinder. We have had the "Joy," "Grimes," "Wil-

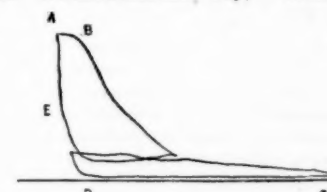


Fig. 6.

son," "Stevens," and all manner of "double valve" gears, but, as yet, this card has not been approached at a speed of 50 miles per hour in single expansion engines.

There are many other thoughts on this point which will suggest themselves to our readers after a comparison of these cards, the subject being almost as broad and exhaustless as it is interesting.

With the double expansion engine the case is quite different, because ample provision is made for starting trains independently of the essential features of valve gear design by means of the admission of higher pressures to the large cylinder, and, therefore, the link motions can be for such engines designed to be at their best when the speeds are high, and not in any

way interfere with the power available for starting. To obtain such a desirable condition with the single expansion engines requires an entirely different valve motion from those now in use. It must have independent exhaust and steam valves and, what is harder to obtain in a satisfactory form, a variable exhaust pipe opening in order to reduce the resistance causing back pressure.

The foregoing shows the greatest of all the advantages of the double expansion engine in American service, and as a conclusion, at this point, one might say that, while there is not in this country sufficient call for an increase of economy in fuel consumption to warrant or force the adoption of the double expansion engine on that score, there is, yet, such a strong demand for a locomotive equally powerful at high and low speeds, and with a wide range of cylinder power, that, if the double expansion locomotive can once establish for itself a reputation in this respect, its adoption in this country will be rapid and gratifying to its promoters.

The following notes which are deduced from the results of actual operation of the double expansion locomotive may be useful to those who are thinking of investigating the subject with a view to a possible adoption of such engines in the near future. The inertia of the 26-in. and 30-in. pistons is very great, and care must be taken to make them as light as possible. The difficulty of balancing is increased where the wheels are not coupled together. "Allen" or double port valves are used to assist steam entrance into the lower pressure cylinder on account of its large diameter and the limited size of the ports which can be used.

Mr. Edgar Worthington, in a paper before the Institute of Civil Engineers, in a general way, states the following minor advantages obtained by using the compound engine in English service. These advantages are the results of practical operation:

- (1) Saving of fuel, about 18.8 per cent. over and above the ordinary engines; the ordinary engine using a much lower pressure.
- (2) Avoidance of long expansion of steam in one cylinder.
- (3) Less leakage of the pistons, brought about by less differential pressure on opposite sides of the piston.
- (4) Higher grades of expansion with less wire drawing.
- (5) Less wear and tear of the boiler by reason of reduced shocks when valve is open. And
- (6) Decreased force of blast with equal draft in tubes.
- (7) It was found that the blast pipe could be made from one-quarter to three-eighths larger in diameter with this type of cylinder.
- (8) The number of exhausts being only one-half of the previous number, the disastrous effects upon the fire were diminished.
- (9). The use of high pressure steam demands better boiler construction, superior lubricants and an excellent quality of gland packings, metal packings being preferred.

It is stated that high pressure steam corrodes cast iron more readily than low pressure. The advantageous results of higher pressures in the compound engines cannot be obtained unless more attention is paid to the heat insulation of the cylinders and piping. It is found necessary in some cases to place relief valves in the cylinder heads on the low pressure cylinder, owing to the large amount of water which is found therein. The Worsdell passenger engine has indicated 911 horse-power at 60 miles per hour; the Webb 1,000 horse-power.

It has been one of the claims of American locomotive builders, and most American railroad men, during the last five years, that the ordinary locomotive has altogether too little weight upon the drivers to furnish sufficient adhesion to resist the cylinder power and prevent the slipping of the drivers. There is a wide difference between such opinions and those indicated by the advantages claimed for the compound engine, because the compound engine has far more cylinder power at its disposal in emergencies, in proportion to its weight, than the ordinary locomotive.

It would seem as if the compound locomotive had the better of the argument, because, while there is reason in the statement that a locomotive should have no excess of cylinder power owing to the increase of tire wear brought about thereby, yet, it can be said as well that locomotives should have cylinder power enough to produce the maximum pull upon the draw-bar, attainable with the given weight which is available for adhesion, at all times. Now, while it is evident that most of the locomotives in service in America can readily slip their wheels at slow speeds and at the maximum cut-off, yet it is true, as well,

that at high speeds there is far too little cylinder power to slip the wheels on a dry rail. For instance, a 17 by 24 eight-wheel locomotive, with 50,000 pounds on its drivers (there are many hundreds of engines such as this in use in America), will generate when starting a train, supposing the driving wheels to be 5 feet in diameter, sufficient cylinder power to readily slip the wheels, and so far as these conditions go, the cylinders are sufficiently large. When this locomotive is running at 50 miles per hour the cylinder power is wholly insufficient to "skid" the wheels and there is no possibility of increasing it by the admission of more steam, because if the cut-off be lengthened, to increase the amount of steam entering the cylinder per stroke, the result is the choking of the exhaust to an extent which will decrease the power and thereby reduce the speed. There is in all that class of locomotives which may be termed "single expansion locomotives," one cut-off for a given speed where the locomotive will exert a maximum effective cylinder power available for hauling the train. Any variation from this cut-off either way while the locomotive is traveling at the given speed will result in decreasing that speed. If the cut-off be shortened the speed will decrease because of lack of power. If the cut-off be lengthened then the power decreases owing to the choking of the exhaust and consequent lack of power. The condition is, then, that nearly all American or foreign single expansion engines, while having sufficient, and, in general, an excess of cylinder power for their adhesive weight at low speeds, and being thus, in a limited way, "over-cylindrical," are in reality much under-cylindrical at high speeds.

An examination of the dynamometer diagrams taken from any train at high velocities will show that the actual pull upon the draw-bar, needed to propel the train, is not, comparatively, large, and if the total adhesive weight of an ordinary engine was available for hauling trains at high velocities, there would be no difficulty in attaining sixty miles per hour or more, under the conditions of large trains and medium weight locomotives.

A majority of the American Superintendents of Motive Power think favorably of the double-expansion locomotive, and, probably, during the coming year, several American designs will appear. Less is expected of them in the matter of economy than in effective operation. While the American railroad official is desirous of obtaining economy, he is far more anxious about the arrival and departure of trains according to the schedule time, and in this respect the compound locomotive offers several attractions which may lead to its general adoption, on American roads, under conditions which would confine its sphere of usefulness to a few progressive railroads if its only claim was that of superior economical operation.

State Railroad Commissions.

It is about twenty years since the Massachusetts Railroad Commission was first established. The action of that body was for a long time accepted as the type of what a Railroad Commission naturally would do. Its history is familiar. It had no power except the power to report; but it used this power with such intelligence as to have great permanent influence on the development, not merely of Massachusetts or of New England, but of the country as a whole. Much of the authority of the Inter-state Commerce Commission, though exercised in a different way, has been of this general character. Its utterances have commanded respect, not because the law gave specific powers to decide or to enforce decisions, but because the principles were wisely stated and impartially applied. The moral authority of such a body was far greater than its technical jurisdiction, and this moral authority gave its rulings almost, if not quite, the force of law.

But another class of commission has grown up side by side with the older type. Many of the state commissions of to-day are executive bodies, designed to do the actual work of government, rather than to give opinions and make reports. Such experiments are by no means new. The Illinois Commission has had something of this character from the very first. Such has been also the case with most of the commissions in the South and many of the more recent ones in the West. Even where they have not had the direct power to prescribe schedules of rates they have often been given the right to make rates which should be *prima facie* binding, and thus secure nearly the same result in a somewhat different fashion.

In all these attempts they were a good deal restrained by the courts. If the commission went too far there was great danger that its action would not be upheld. If the people demanded a great deal

the commission might establish extreme schedules, as was done in California; but the very extent to which it carried such powers served to relieve the railroads from the necessity of taking any notice of it. Of late, however, the action of state commissions has been at once more radical and less subject to restraint. Several causes may account for this. The depression in prices which culminated in 1886 and from which we have but slightly recovered, made it harder for the owners of land in new country to pay their debts. To any such man the necessity which he was under of paying the interest on his mortgages seemed far greater and more important than the necessity of the railroads to pay interest on their mortgages. He was told, with more or less truth, that these railroads were capitalized at a false rate. He believed, generally with correctness, that his farm improvements were capitalized at a much truer figure, and he used his power in sending representatives to the legislature who would enable him to pay his interest, even if the railroad companies were forced to default on theirs. Meantime the indirect effect of national railroad legislation was such as to take away many of the restraints on what the state authorities might do. The fact that the Inter-state Commerce law was passed, and that it seemed to be successful, led a great many people to think that any law which was passed had a fair chance of being successful. They did not reason very much in these attempts. Wherever they saw a head they hit it. We called attention a year ago to the Minnesota bill, which in one section tried not to allow a railroad to charge as much per mile for a shorter distance as a longer, and in another section not to allow it to charge as much per mile for a longer distance as for a shorter. Few of the inconsistencies were quite as obvious as this, but there were a great many laws passed which were equally impractical.

Even in the worst cases the commissioners rarely went so far as the legislators themselves would wish to do. Their position gave them a certain responsibility for whatever might be done. It forced them to study the actual working of railroad business, and however much they might wish to please the state authorities, by whom they were appointed, they could not wholly ignore the permanent needs of the railroads. They could not be blind to the ultimate results of work for which they would be held responsible. The same thing was felt in railroad regulation which is seen in municipal government. A responsible head of a department, no matter how corrupt the machine by which his nomination is dictated, will usually do far better than a board of aldermen. In these respects it is possible for official virtue, or at any rate official intelligence, to rise higher than its source. We have seen it in the case of large cities. We sometimes see it in the case of railroad commissions.

The most amusing instance just at present is in Oregon, where Gov. Penoyer removed the Railroad Commissioners because they did not believe that the Legislature could fix a definite schedule of rates. What makes the matter all the more striking is, that this same Governor approved the bill that created the Commission, and himself selected and appointed the Commissioners. In its recent report, the Commission says that it came to the performance of its duties without knowledge of railroad affairs; but during the two years of its existence the members of the Commission have studied railroad problems and have found out so many things that they cannot possibly approve some of the cruder notions of the Governor. They have learned something, and, therefore, the Governor removes them. This fact illustrates two distinct points. First, the advantage of regulation by commission, even under the most unfavorable circumstances, over direct attempts of the Legislature to fix rates; secondly, the irrational character of the mania for railroad regulation which is now sweeping over certain sections of the country, and which can only be compared with the experience in the Upper Mississippi Valley fifteen years ago.

All this reminds us of the state of thing in one of our theological seminaries. It had a creed which its professors were forced to subscribe to on taking office; and at stated intervals they were compelled to renew their subscription. A theologian in a rival institution, who did not believe in this policy, described the case as follows: "They have a creed which every professor must sign and which makes sure that they will not get anybody there that knows anything; but he might learn something after he gets there, and they want to be able to turn him out as soon as he does." This is the situation in Oregon. The Governor can appoint men who know nothing; but there is a terrible danger that they will learn something during their term of office, and then he feels the necessity for radical reform.

Standard Axles for 60,000-lb. Cars.

At the meeting of the Western Railway Club on Tuesday afternoon of this week, the subject of a standard axle for 60,000-lb. freight cars was considered by the members with an attention which is promising. It looks now as if, at the coming convention of the Master Car-Builders' Association at Niagara Falls, there would be a decision regarding this much contested detail of equipment. The discussion by the Western Railway Club shows how clearly necessary it is to present the true conditions under which the new axle must operate, in order to draw out what are the real convictions of various master mechanics. This subject was introduced by a paper on the subject by Mr. Godfrey W. Rhodes, which is printed in another column. No one can read Mr. Rhodes' paper without becoming interested in this question, and several railroad men at the meeting considerably strengthened their convictions in relation to the most desirable form of axle by close attention to the discussion, as was made evident by their change in opinions as the talk progressed. After the paper was finished the discussion contracted quickly to a consideration of the length from centre to centre of journals. At first there was some dispute regarding the advisability of attempting to maintain the same centres as now used with the Master Car-Builders' standard axle with $3\frac{1}{2}$ in. by 7 in. journal, but the strong discussion and clear explanation of the reasons for so doing, which were presented by Mr. Rhodes, Mr. Schroyer, Mr. Middleton and others, soon cleared away the greater number of objections raised, and after an extended discussion, in which Mr. Middleton showed that he was commonly using axles quite the same as the one illustrated by fig. 4, accompanying Mr. Rhodes' paper, with good success, a motion was made and carried, as the expression of the members there present, that it was desirable to adopt, as a standard, 6 ft. 3 in. as the dimension from centre to centre of journal, for the following reasons:

(a) It is not advisable to increase the distance between the centres of journals, because it throws the bearing point of the load further from the centre of the wheel than it now is, resulting in the following difficulties: 1. Greater strain upon the axle at its centre between wheels. 2. Greater strain upon the axle at the junction at the wheel. 3. The greater deflection of the axle, if made longer between centres, would result in its becoming more out of line with the brass, thereby causing irregularity in wear of the journal. (b) It is not economy to increase the distance or even to change the distance from centre to centre of journal, because such a course prohibits the use of the axles in cars of less carrying capacity. (c) An increased distance from centre to centre of journal changes the design of the truck box and centre to centre of truck frames which would require an addition to the already large stock of patterns and templates to be kept in car shops.

The question of the advisability of allowing the possibility of requiring an axle in the future suitable for an 80,000 lb. car to influence the present design was raised as usual in this discussion. Mr. Rhodes called attention to the rapidly increasing wear of car wheels when the weight upon them was augmented. To illustrate this he cited the increased wear of engine truck wheels over those same wheels when placed under freight cars where the weight per wheel was considerably less. He offered as a solution of the heavier car problem the adoption of more wheels and axles per car, and suggested that we might learn a lesson from our experience with brakes and couplers on passenger cars which would be useful to us in considering the designs of heavier freight cars. He showed how the increasing weights in passenger cars of various kinds and baggage cars had demanded six-wheel trucks, and prophesied that if cars were to be made with a carrying capacity of 80,000 lbs. and over such cars must have trucks of more than four wheels. Our readers will remember that at a meeting of the Western Railway Club during 1887, at which this question of axles was considered, Mr. Barr, of the Chicago, St. Paul & Milwaukee, stated that in his experience car-wheels which were loaded with loads of 60,000 lbs. per car and upwards had a much shorter life in proportion to the ton-miles of performance than those which carried lighter loads. There are many railroad officers who strongly object to six-wheel trucks under freight cars on account of the great cost of repairs, and this objection came up at Tuesday's meeting. Mr. Rhodes called attention to the fact, which is becoming more and more apparent daily, that the differences between the demands of freight and passenger service are greatly decreased.

Among the interesting questions brought up by the discussion is one which is worthy of considerable attention, and that is the desirability of allowing the back of the axle-box to press against the outside face of the wheel. This plan is in use upon the Illinois Central, the Rock Island, and to some extent upon the Pan Handle and Chicago & Northwestern roads. This information was brought out by a statement that a large percentage of the hot boxes, as shown by the inspection of piles of scrap, were caused by the extreme end pressures on the brass. This is also seen by an inspection of the scrap heap of axles. Mr. Rhodes and Mr. Schroyer both called particular attention to this matter, and stated that although we had been paying considerable attention to the reduction of hot boxes by increasing the length and diameter of the journal, yet we had paid almost no attention to the reduction of hot boxes by reducing the possibilities of heating caused by end pressures on the brass. Mr. Rhodes showed that even in discussions and reports to the Master Car-Builders' conventions no attention has been paid to this matter, and as a proof he showed the dimensions of the axles offered and which were rejected on letter ballot. The disposition of the

meeting seemed to be in favor of allowing the end thrust to be taken on the back of the truck box. The success of this plan upon the Illinois Central and other roads, as shown by Mr. Snow, Mr. Verbruyck and others, goes to indicate that there is an advantage in this design. On the Illinois Central the boxes are placed when new to within one-eighth of an inch of the wheels. This is very close, and the point was raised whether or not there would be a marked increase of friction by reason of the box rubbing against the wheel in a great many cases. A majority of those who recommended this plan thought the boxes should be kept away from the wheels about one-half an inch on each side. It was stated by those who had had experience in this particular that sufficient oil leaked out and over from the oil-box to lubricate the face of the wheel at all times. To effect this change it was simply necessary to cast a thick collar on the back of the axle-box to fill up the space.

In order to narrow the limits of the discussion Mr. Rhodes showed the desirability of postponing all considerations of diameters and exact dimensions needed for strength in different parts until the distance between centres has been settled. This is an important point, and for the present all considerations of diameters can be waived until the distance between centres is settled. At this meeting no good objection was raised to the adoption of the present distance from centre to centre of the journals as a standard for 60,000-lb. cars, and the many arguments offered in favor of it are sufficient to overpower any objections which will probably be raised. The strongest argument is that of economy. It was suggested by Mr. Setchell that it is not customary to use old axles of large diameters under cars of small carrying capacity by refitting the journals because they are too small for good service from the first. He offered the following example. The road had been using $3\frac{1}{2}$ in. journals under 40,000-lb. freight cars, and having serious difficulty, not only with the heating, but the breaking of these axles, they decided that any axle whatsoever in service after running a certain number of miles was unfitted for use, and therefore they adopted a limit of mileage, at which limit the axle, even if it was to all appearances in good condition, was thrown into the scrap. This proved to be very expensive and still having great difficulty with heating, they determined to try a larger axle and on the adoption of the Master Car-Builders standard the axle was found to have so much longer life that the limit of mileage was raised from 60,000 to 100,000 miles and afterward it was raised to even more than 100,000 miles, and now the mileage restriction had been wholly removed, and the only limit placed upon the life of an axle is its diameter. After an axle is worn down to a certain dimension it is discarded. This, Mr. Rhodes stated, fully convinced him that when an axle was large enough there would be no danger of crystallizing, and there was no reason why any mileage limit should be placed upon an axle, or why an axle should not be used under lighter cars when it had done good service under heavier cars after being worn down to the limit of the heavier service. It was the opinion of Mr. Schroyer that the only limit of the diameter of the journal advisable for 60,000-lb. car should be that which retained the same distance between bolt holes which bolt the axle-box into the truck frames.

The objections offered to design No. 4, which is that shown by the dotted line in fig. 4 of the illustrations accompanying Mr. Rhodes' paper, were that the distance between the inside neck of the journal and the inside edge of the oil guard would be much decreased, and render it possible for the edge of the dust guard cavity to catch on the inside neck of the journal when the brasses were worn down thin. Mr. Middleton, Mr. Rhodes and Mr. Schroyer showed how this difficulty could be removed by building up the inside wall of the dust guard cavity and making thinner the outside wall; thus, in effect, moving the dust guard toward the wheel.

We have just received from Mr. J. W. Post, Permanent Way Engineer of the Netherland State Railroad Co., some comment on recent criticisms of the form and details of his steel tie and criticism of designs that have been recently offered. It is probable that there is no other railroad engineer who has had so much actual experience with metal ties as Mr. Post and who has studied the subject so thoroughly. Therefore, what he has to say in the matter deserves much weight. The Post tie has within a short time been introduced into the Argentine Republic, and 700,000 of these ties are now in use in Europe, Sumatra and the Argentine Republic. A feature of the Post metallic tie, to which the designer attaches much importance, is the thickening of the rail seats directly by rolling. He calls attention to the fact that in most other ties this part is weakened by cutting out clips, or other methods of fastening the rails. This is strikingly the case in the so-called "Standard" tie, the sides of which are cut out $\frac{3}{4}$ in. directly under the rail, and the bottom further weakened by cutting out the holes for the clips. The Hartford tie also is criticised by Mr. Post, for the reason that the metal is not most economically distributed, as the thickness is uniform throughout. Direct contact between the metal of the tie and the rail, Mr. Post does not consider a serious objection. Crystallization has never been observed, and the noise is not seriously greater than with wooden ties. In fact, the perfect contact which can be maintained between the rail and the tie prevents any clicking or rattling between the two bodies, and whatever additional noise there may be with the metal tie is due simply to the fact that it is a better conductor than the wooden tie. This objection, however, has not prevented its very wide adoption in several countries. No trouble is found from lateral motion of the Post tie, and the ends can be bent down into the ballast as deep as it is desired. Moreover, the Post tie has a somewhat additional hold in

this direction from its contraction in the middle, making a waist, giving not only greater lateral stability, but increased strength vertically, inasmuch as the side flanges are deeper in the middle than elsewhere. The use of a wooden block in the metal tie Mr. Post considers a step in the wrong direction. This was tried on the Netherland state railroads in 1865 with the Cosijens tie. This tie, after 15 years use, had given very satisfactory results, so far as the metal part went, but the oak blocks had needed frequent renewal. The wooden block in the "Standard" tie would probably be found even less durable than it was in the Cosijens, inasmuch as it is inclosed by the metal. The fastenings, also, of this tie are considered very faulty, in that they are so arranged that a very small wear on the block will leave the fastenings loose and cause them to rattle. The Post fastening costs 24 cents a tie in Europe. It consists of 16 parts per tie, that is, 4 bolts, 4 nuts, 4 spring washers and 4 clips. The bolts, nuts, washers and clips are all uniform in size and style, and any laborer can apply them. The number of parts can be still further reduced by dispensing with the 4 spring washers, as is done in the Hartford tie.

The Duluth, South Shore & Atlantic has adopted a sensible scheme for facilitating telegraphic communication with delayed trains, which is second only to the train telegraph in efficiency. The telegraph stations on this road are from 10 to 20 miles apart, and trains are, therefore, liable to considerable delays when at long distances from stations, especially in winter, and in case of a serious accident involving personal injury, the avoidance of delay in reporting to a station or to headquarters may be of great consequence. The company has, therefore, placed upon each passenger train a baggageman who is a telegraph operator, and has furnished him with wire, climbers and Morse instruments. While this is an excellent plan, and one which is demanded by ordinary considerations of humanity, as well as of economy, on a road running through a thinly settled country and in a cold climate, it would seem that a road so situated is just the place where the train telegraph would be most valuable. This is especially the case on a new line, which is likely to have a good many work trains on the road in the summer. Most new roads, also, are peculiarly liable to washouts and landslides, so that the ability to communicate from any point on the road at short notice is a decided advantage. The principle that, in order to have an appliance available in emergencies it should be kept in use regularly, probably has some bearing here also. There is, to be sure, no great danger that the operator-baggageman would fail to open communication when he once set out to do so, but there would be cases where he would be in doubt whether the occasion demanded his taking a frigid air bath at the top of a 30-ft. pole, and needs of anything less than a desperate character might thus go unfulfilled. The train telegraph is not only valuable for emergencies, but is a constant convenience in every-day work.

A letter of President Ledyard, of the Michigan Central, to Senator Palmer calls attention to a dangerous provision of the present River and Harbor bill, which gives the Secretary of War absolute power to prevent the construction of any bridge over any navigable stream, within the limits of a state, unless his approval is first obtained to the plans of the bridge, and inflicting upon any one, for violation of such section, the penalty of \$10,000 fine, or 12 months' imprisonment. In the first place, this seems quite unnecessary since the secretary can, under existing statutes, secure the removal of any bridge which obstructs navigation. It is also capable of doing great harm. The interests which are subserved by the construction of a railroad bridge are usually much more important than those involved in the unimpeded navigation of minor streams. Yet the law continues to treat the scow as the representative of public rights and the railroad as an interloper. It allows thousands of passengers to be delayed at the northern entrance to New York City in order that a single boat between the Hudson River and the Sound may be saved the necessity of taking a slightly circuitous route. The present law proposes still further to increase the disabilities of the railroads in this matter. The example of possible dangers which Mr. Ledyard draws from the lumber districts of Michigan, applies, with but slight changes almost anywhere. "Is it right?" he asks "that, after the properly constituted State authorities have authorized the construction of such bridges, the Secretary of War should be empowered to inflict severe penalty and imprisonment upon those who have proceeded to act under the full sanction of the laws of this State?" We heartily agree with him that this "is carrying centralization too far." What may come of such a policy is seen by the example of France, where the government engineers exercise great powers of supervision from which there is no appeal. A commune desires to build a branch line. The location is arranged; the money actually subscribed. Suddenly the central government comes in, and says that the road is not a public necessity; and local interests are helpless. This is an actual evil in France; the proposed bill goes far to make it a possible one in the United States.

The investigation of the Inter-state Commerce Commission as to the enormous shipments of export corn by certain Baltimore houses was hardly thorough enough to be conclusive. The large corn crop of last year furnished reason enough why Baltimore exports should have some relative advantage over those from New York. Whether this advantage was artificially increased by railroad policy can only be determined by a thorough investigation of the conditions affecting ocean transportation as well as that by railroad. This investigation does not seem to have been attempted. As to

the alleged preferences given to certain Baltimore firms, there seems to have been little direct evidence; but the questioning on this point was decidedly meager. Unless the investigation covered a great deal more ground than was hinted in the newspaper summaries, the answer that rates were made in "the West" was allowed to pass muster, and nobody insisted on knowing anything further as to the methods of agents. Such ignorance might readily be made to cover a multitude of sins.

The reason for the mysterious persistency of the Pennsylvania in keeping grain rates low during the heavy traffic of last fall now clearly appears. And the futility of trying, under present laws, to prevent reductions of rates like that which started that movement is equally clear. The Baltimore & Ohio, in connection with Western lines, may have made a rate 3 cents below the regular tariff with perfect legality, as through rates are not necessarily published unless the Commission orders it done. They are, indeed, to be filed with the Commission, but the government buildings at Washington would hardly afford room for the army of clerks that would be necessary if it were intended to promptly examine and compare all such tariffs and publish such as might be deemed important. The amendments proposed by Judge Cooley looking to securing further publicity are as necessary as the provisions of the law already in force.

In connection with the recent reductions in Iowa rates, it is interesting to note that the Chicago, Burlington & Quincy has reduced its train service some 8000 miles monthly, and is about to make an additional reduction of the same amount. In itself this does not seem very large, 16,000 miles per month is only 260 miles a day each way, or less than one third of a train each way for every mile of track in Iowa. But it forms an appreciable proportion of the whole service of the road. The total Iowa train mileage of the Chicago, Burlington & Quincy, as given to the Iowa commissioners for the year ending June 30, 1888, was 4,865,832 or little over 400,000 miles a month. In case the reduction of train service is practically confined to Iowa, it represents about 4 per cent. of the whole. Such a loss soon makes itself felt by the community. People are accustomed to a certain amount of train service; if deprived of it they feel the want severely. They begin to see that reducing rates by law is not such fun as it appears. And the evil is one which increases as time goes on. When equipment begins to wear out, it will not be replaced for the benefit of a community which avoids paying for it.

The annual "Record of Transportation Lines owned and operated by and associated in interest with the Pennsylvania Railroad" has just been issued in a pamphlet of 28 quarto pages. It is a record of mileage on Dec. 31, 1888, compiled from data in the office of the Chief Engineer. The length of main line is given in detail by States and then is summarized. In another classification the length of tracks is given by divisions. The length of first, second, third and fourth track is given and also of company's and private siding, together with the increase or decrease of each during the year. The total miles east of Pittsburgh and Erie are 4,601.43, of which 387 miles comprise canals and ferries. The total miles of the Pennsylvania Company, west of Pittsburgh and Erie, are 999.83, and the grand totals of allied lines are 7,581.22 miles of main line and 12,510.31 miles of track.

The Cincinnati, New Orleans & Texas Pacific experienced, on Feb. 16, the kind of disaster which figures in the minds of many railroad officers as the most to be dreaded in the whole list of possible calamities, though this case happily resulted in no loss of life. A rear collision of freight trains occurred in tunnel No. 17, near Oakdale, Tenn., 105 miles north of Chattanooga, and a loaded oil tank at once took fire from the caboose stove. The fire was, of course, furious; fire engines were sent from Chattanooga, but they did little good. The flames were still unsubdued the following evening, and the wooden roof of the tunnel was undoubtedly ruined. A temporary track was built around the mountain, which it was announced would be completed in three days.

NEW PUBLICATIONS.

Financial Review for 1889. William B. Dana & Co., publishers, 102 William street, New York.

This well-known annual is issued from the office of the *Commercial and Financial Chronicle*. It contains editorial reviews of the year's business and a great mass of statistics showing prices of securities of all sorts and, to some extent, the course of commerce and investment. The *Investor's Supplement* of Jan. 23, containing an article showing the dividend of various railroads for the past seven years, is included in this volume.

Plans for an Auxiliary Supply of Pure Water Under Pressure for the City of New York. John R. Bartlett and Associates, New York.

This is a collection of maps and documents going to set forth the project for bringing water from the Passaic watershed into the lower part of New York City. The proposition is to furnish from sources independent of the Croton watershed not less than 50,000,000 gallons daily, to be delivered under a head of pressure of at least 300 ft. Mr. Bartlett and his associates offer to furnish this water at a price of \$75 per million gallons, and to begin to deliver it within three years from the date of contract.

Annual Report of the Chief of Engineers United States Army for the year 1888.

This report, which contains a full record of the year's work of the corps of engineers, is too well known in its scope and character to require any comment.

The February number of the *Journal of the Association of Engineering Societies* contains articles on the West Point Tunnel, Landscape Engineering, Farm Pond Conduit—Boston Water-Works, Skill and Art in the Heathen Era, and Thickness of Water Pipe. The usual index to current literature appears also.

TRADE CATALOGUES.

The Worthington Independent Condenser. Henry R. Worthington, New York.

This is a pamphlet of 40 pages, descriptive of a condenser involving to some extent the injector principle, in combination with an air-pump of the well-known Worthington duplex type; the special arrangement allowing the air-pump to be used as a water elevator when desired. The various applications of the condenser to land, marine and pumping engines, vacuum pans, and also for use in connection with surface condensers, are fully illustrated and described in this pamphlet; and there are directions for erecting and managing the apparatus. A novel and useful feature is shown in the form of a special air-pump, with extra suction for converting the plant into an efficient fire-pump.

Catalogue of the Gold Car Heating Co.—This is an illustrated catalogue and price-list of the apparatus and special parts manufactured by this company. The storage system, thermostatic trap relief valve and various styles of coupling are well illustrated and described. Diagrams of standard piping, and of piping for various special purposes, are also shown. The apparatus here illustrated has been developed by six years of practical and successful use, and the system is now applied to over 2,500 cars and locomotives on nearly twenty different railroads.

THE SCRAP HEAP.

Notes.

The Philadelphia & Reading Employees Relief Association has now 10,600 members, which is said to be 76 per cent. of all the employees eligible to membership.

The committee of the United States Senate has taken action which it is said precludes all possibility of accomplishing any legislation concerning the Pacific railroads at the present session of Congress.

The Adams Express Co. has, in consequence of disagreements with the Philadelphia & Reading concerning the handling by that road of traffic for the United States Express Co., withdrawn all its business, and will confine itself to the Pennsylvania road in the territory affected.

The United States Circuit Court at Chicago is hearing arguments on the suit of the Pullman against the Wagner Car Co. for infringements of the patents on vestibule cars.

Burlington Dynamiters.

Bauereisen had hardly become accustomed to his surroundings in the penitentiary when Goding was indicted by the grand jury at Geneva for complicity in the "Q" dynamite conspiracy. We have not heard, by the way, that Bauereisen has been expelled from the Brotherhood. Our recollection is that something was said last summer by Brotherhood officials about formally disowning the conspirators when they were found guilty of the charges made against them. Is it still argued that Bauereisen is not guilty?—*Railway Review*.

The Coupler and Crossing Laws in Michigan.

The existing law in Michigan requires that some form of automatic car coupler shall be used on every freight car constructed, purchased or leased for use in that State, subject to the approval of the Commissioner of Railroads, and that no freight cars shall be run on any of the railroads in the State after Jan. 1, 1891, unless furnished with automatic couplers. An amendment removing the limitation of time has been drafted and it is expected that it will pass the Legislature. The compliance with the law has been considered impracticable because of the difficulty of agreeing upon a uniform coupler.

A bill has also been introduced amending the law for the protection of grade crossings, giving the Commissioner power to prescribe a system of interlocking at any existing crossing. He now has authority to prescribe the use of interlocking at all crossings and junctions, provided that at crossings where trains come to a full stop no interlocking system shall be required. Since August, 1887, no new grade crossings have been permitted, unless some form of interlocking and derailing system was provided.

In the Waiting Room.

"I don't wish to deprive you of your seat," said a lady in the crowded waiting room of the Baltimore & Ohio station in thanking a gallant and highly-dressed colored gentleman who had given up his seat to her. "No depravity at all, I assure you, Madam," and the accommodating gentleman of color moved off to one side to speculate on what the half-suppressed giggle among the waiting passengers meant.—*The Daily Romancer*.

Switching and Demurrage Charges in Michigan.

A bill has been introduced in the state legislature providing that railroad companies shall be entitled to receive only \$1 switching charges for the transfer of a car from one yard to another, or from any track for a distance of three miles or under. It is also provided that the companies shall be entitled to receive \$1 per day for every car left to be loaded or unloaded which is detained longer than three days.

Railroad Extension in Cuba.

It is proposed to extend the Western Railroad of Cuba, for which the detailed conditions will soon be published, and tenders received by the Spanish government.

Ohio Roads in 1888.

The annual report of the State Railroad Commissioner of Ohio, will place the number of miles of road in Ohio at 10,227. The funded debt of the roads is \$483,876,418, an increase of 10.37 per cent., the proportion of the debt for Ohio being \$364,183,374, an increase of 19.42 per cent. The unfunded debt is \$33,916,293, the proportion for Ohio being \$18,556,318, an increase of 28.57 per cent. During the year \$7,012,496 was paid in dividends. The gross earnings for the year were \$116,065,807; operating expenses, \$80,524,561; net earnings, \$35,559,757, a decrease of 4.59 per cent.

Fruit Transportation.

A small lot of oranges, shipped from Riverside, Cal., was received in New York last week. The oranges were part of a consignment to Chicago, sent in the ordinary course of business in Tiffany refrigerator cars. When the boxes were opened in New York, being received there by express from Chicago, the oranges were found to be in perfect condition in every way. The fruit is cooled before shipment, and held

at a practically uniform temperature. This shipment was made to show that Florida oranges could be shipped to New York without damage by this means of transportation, the refrigerator cars being especially adapted to this class of traffic. The plan proved very successful last season, 125 car-loads having been shipped from Southern California to Chicago and the Northwest. The Missouri Car & Foundry Co. is now building 200 additional refrigerator cars to be run over the Atchison, Topeka & Santa Fe system.

New Stations.

The passenger station to be erected by the Hartford & Connecticut Western, at Hartford, Conn., will be of brick 28 x 100 ft. and three stories high. Bids will be received by S. B. Odyke, Jr., General Superintendent, Hartford, until Feb. 25.

The Pennsylvania will make several improvements on the lines near Pittsburgh, besides the great bridge for the Ohio Connecting road below the city. New station buildings will be erected at various points. One at Jeannette will cost about \$7,000 and will be a brick building, two stories high. New buildings are also to be erected at Swissvale and Roup stations, which are to cost about \$6,000 each. The new station at Brinton, which is to cost \$3,000, will be completed in about a month. The new one at Uniontown, which cost \$7,000, was opened recently.

Gas Lighting.

The *Financial Times*, London, states that the Metropolitan Omnibus Company has replaced oil lamps by gas jets. The gas is contained in a small reservoir, similar to those in use in the railway carriages of the Metropolitan District railways, and is carried underneath the vehicle. The light given is greatly superior to oil, and enables the passengers to read a paper with comfort. It would be a great kindness to those riding on their lines if the elevated roads in New York city would follow the example of the London Omnibus Company. A row of gas or other effective lights on the sides of the cars, instead of being massed over the aisle as at present would be a great luxury to many of the patrons.

An Elevated Railroad Project.

The City Railway Company, of New York city, which was incorporated last March, proposes to buy a right of way through the blocks and build an elevated railroad from South street to Fifty ninth street, crossing Broadway below Rector street and running up the west side. It is proposed also to build a line on the east side to the Harlem. Many preliminary notices of condemnation have already been served on property owners.

Pig-Iron Production in 1888.

Mr. Swank's compilation of the returns from our smelting furnaces shows a total product of 6,490,739 gross tons, as against 6,417,148 tons in 1887, a gain of 73,591 tons, or a little over one per cent., instead of the loss that was expected. This gratifying increase in production occurred in the last half of the year, the production for the first half having been 3,020,092, and for the last half, 3,470,647 tons.

Classified by the fuels used, mixed coke and anthracite being included in anthracite, the production has been:

	1887.	1888.
Bituminous.....	3,813,067	4,236,705
Anthracite.....	2,087,848	1,719,401
Charcoal.....	516,233	534,633
	6,417,148	6,490,739

As will be inferred from the above table, there has been a loss in the amount of production in Pennsylvania, New York, New Jersey and Maryland, and also in Wisconsin and Missouri. The production in Ohio, possibly somewhat influenced by the consumption of iron in shipbuilding on the lakes, has increased from 871,017 to 985,552 long tons, a gain of 13 per cent. Mr. Swank gives the production in the South by states for the last four years in net tons as below:

States.	1885.	1886.	1887.	1888.
Alabama.....	227,438	283,859	292,762	449,492
Tennessee.....	161,199	199,166	251,344	267,931
Virginia.....	163,782	156,259	175,715	197,396
West Virginia.....	59,067	98,618	175,715	197,396
Kentucky.....	37,553	54,844	41,307	56,790
Georgia.....	32,924	46,490	40,947	39,397
Maryland.....	17,299	30,502	37,427	17,606
Texas.....	1,834	3,250	4,383	6,587
North Carolina.....	1,790	2,200	3,640	2,400
Total.....	712,835	875,179	929,436	1,132,858

This output of 1,011,480 long tons may be compared with our total production of 831,769 tons in 1865 and 1,205,663 in 1866, and it may be noted that our total production in 1879, our year of greatest production up to that date, was 2,741,853, showing an increase in the past ten years of nearly 137 per cent. It is doubtful if England will show an increase for the same time of over 25 per cent.

The stock of unsold pig iron, 300,144 long tons, is slightly less than a year ago, notwithstanding the increased production of the last six months.

An Electric Arcade Road in London.

A Colonel Hazard is proposing a subway in London with four tracks, for local and express traffic, to be operated and lighted by electricity. Two lines start from Aldgate, in the neighborhood of the General Post Office, one passing through Newgate, Holborn and Oxford street to the Bayswater end of the town; the other to go through Fleet street and the Strand to Hammersmith, with connecting lines at various points. The *Financial Times* is disturbed at the proposition to put it just below the surface, saying: "But, being at so shallow a depth, the rumble and vibration of the trains would be likely to shake house foundations, debilitate structures and terrify horses to such an extent that Pickford's and the railway van, the aristocracy, the doctors who drive in carriages, the omnibus companies, cabby and others would find the surface roadways unusable," and thinks either the road or the project is threatening to shake the foundations of society. If Colonel Hazard is not more successful in promoting his road than our arcade people have been, the excellent pavements of London will be usable for several years to come.

Passes.

The free pass abuse has obtained such a hold on the Ohio Legislature that the House chaplain felt called upon to pray recently: "Oh, Lord, teach these members to remember and to know that there are no free passes to heaven."

Notes of Travel in Australia.

The members of an American base ball club traveling in Australia tell their experiences on the railroad from Sydney, New South Wales, to Melbourne, Victoria, in a letter recently published. The company traveled by a special train, but found they were overtaken in a few hours by the regular. They found the English compartment carriages very inconvenient, and had to pass a bottle from window to window to assuage their fierce thirst. Notwithstanding the law posted in each car imposing a fine for meddling with the door, they climbed from one compartment to the other while the train was in motion. This was to relieve the monotony of the journey. The sleeping car is described as very primitive. The lower berth was only a few inches from the floor, and the pillows were of a size suitable for a doll. There were no curtains to the berths, and the five ladies in the party were lo

cated in the front end of the car, a single curtain serving for a partition. The change of cars and examination of baggage which is necessary at the boundary line between the two provinces, on account of the change of gauge and the protective tariff of Victoria, had to be made at 5 a. m. The cars and speed, on the Victoria portion of the line are characterized as very much better than on the other.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago, Burlington & Quincy, quarterly, 1, per cent. payable March 15.

Cincinnati, New Orleans & Texas Pacific.

Fort Wayne & Jackson, semi-annual, 2½ per cent. on the preferred stock, payable March 1.

North Pennsylvania, quarterly, 2 per cent. payable Feb. 25.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Atchison, Topeka & Santa Fe, annual meeting, Topeka, Kan., May 9.

Atlanta & Charlotte Air Line, annual meeting, 48 Wall street, New York, March 13.

Chicago, St. Louis & New Orleans, annual meeting, Memphis, Tenn., March 29.

Chicago, St. Louis & Pittsburgh, annual meeting, Union Depot, Indianapolis, March 20.

Cleveland, Columbus, Cincinnati & Indianapolis, annual meeting, Cleveland, O., March 6.

Illinois Central, annual meeting, 78 Michigan avenue, Chicago, Ill., March 13.

Kansas City, St. Louis & Chicago, annual meeting, St. Louis, Mo., March 12.

Maysville & Big Sandy, annual meeting, Maysville, Ky., Feb. 25.

Mississippi & Tennessee River, annual meeting, Memphis, Tenn., March 29.

Missouri Pacific, annual meeting, St. Louis, Mo., March 12.

New Orleans & Northeastern, annual meeting, New Orleans, La., March 4.

New York, Susquehanna & Western, annual meeting, Jersey City, N. J., Feb. 28.

Peoria, Decatur & Evansville, annual meeting, Peoria, Ill., March 5.

St. Louis, Iron Mountain & Southern, annual meeting, St. Louis, Mo., March 12.

Texas & Pacific, annual meeting, 195 Broadway, New York, March 6.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Railroad Commissioners* of the several states, will, by invitation of the Interstate Commerce Commission, hold a conference at Washington March 5. Subjects for discussion: Uniform railroad statistics; Uniform classification of freight; Railroad legislation; Regulation of railroad construction; Heating and lighting of cars; Automatic couplers and Continuous brakes.

The *National Association of General Passenger & Ticket Agents* will hold its thirty-fourth annual meeting at the Hotel Brunswick in New York, March 19.

The *National Association of Railway Surgeons* holds its annual convention in St. Louis, Mo., May 2, 1889.

The *New England Railroad Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Tiff House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street New York.

The *Boston Society of Civil Engineers* holds its regular meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in St. Louis on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the house of the Club, 1,122 Gerard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Kansas City* meets at Kansas City, Mo., on the first Monday in each month.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m. on the third Saturday in each month.

The *Civil Engineers' Club of Kansas* holds regular meetings on the first Wednesday in each month at Wichita, Kan.

American Railway Master Mechanics' Association.

The Executive Committee has made arrangements to hold the next annual convention at Niagara Falls, beginning Tuesday, June 18, with headquarters at the International Hotel. The terms of \$3 per day have been secured for members and others. The proprietor of the hotel mentioned has agreed to reserve 100 rooms for the use of members. All who wish to secure rooms should apply to Mr. A. H. Gluck, Manager, International Hotel, Niagara Falls, N. Y.

New England Railroad Club.

At the meeting Feb. 14 it was decided to have a dinner on the evening of the second Wednesday in March, the occasion of the annual election of officers. The President stated that this would be regarded as ladies' day and that it was requested that ladies should be invited by members of this club to attend. It was voted to send invitations to the dinner to the Northwest Railroad Club at St. Paul, the Western Railroad Club at Chicago, the Central Railroad Club at Buffalo and the New York Railroad Club. The following committee was appointed to make arrangements for the dinner: Charles W. Sherburne, F. D. Adams, C. J. Post, J. N. Lauder and Charles Richardson.

The following committee was appointed to nominate officers for the following year: John Kent, Charles W. Sherburne and Albert Griggs.

Claim Agents' Association.

A meeting of the Claim Agents' Association of the Eastern, Middle and Southern states will be held at the Hygeia Hotel, Old Point Comfort, Va., March 7. F. B. Goodall, of the Pennsylvania, at Philadelphia, is Secretary of the Association.

Minneapolis Society of Civil Engineers.

At the regular meeting, Feb. 6, Prof. Hoag read a paper on Solar Attachments, pointing out the most common defects and describing Smith's solar compass particularly, and offering a new design of his own. Mr. George W. Sublette read a paper on Sub-division of the Section.

PERSONAL.

—Mr. John W. Street, inventor of the live stock car which bears his name, died at Chicago, Feb. 15, at the age of 52.

—Mr. George H. Boughman has been appointed City Engineer of Wilmington, Del., to succeed Mr. F. H. Robinson.

—Mr. Robert B. Moodie, who has been Western Freight & Passenger Agent of the Inter-colonial since 1881, died at Toronto, recently, at the age of 45.

—Col. W. J. Berg, General Traveling Agent of the Chesapeake & Ohio, has tendered his resignation of that position, to take effect March 1, when he will engage in other business.

—Mr. Frank D. Richards, for the past three years Treasurer of the Indianapolis Car & Mfg. Co., died in Indianapolis, Feb. 17. His funeral was largely attended by employees of the car works.

—Mr. Arthur M. Waitt has resigned his position as Assistant Master Car-Builder of Boston & Maine to accept on March 1 an important position in the service of the Pullman Palace Car Co.

—Mr. G. W. Stevens, Purchasing Agent of the Ohio & Mississippi, will at the end of this month retire from that position to accept a position with Fairbanks, Morse & Co., railroad supplies, of Chicago.

—Mr. David F. Houston, one of the most prominent citizens of Roanoke, Va., State Senator and General Manager of the Crozer Steel & Iron Co., died in Roanoke, Feb. 16, from injuries received from a fall. Mr. Houston was interested in many of the enterprises of Roanoke, was a director in two of the banks and interested in the Norfolk & Western, Shenandoah Valley and Roanoke & Southern roads.

—Mr. C. J. Brydges, Land Commissioner of the Hudson Bay Company, died of apoplexy, Feb. 16, in the hospital at Winnipeg, Man., which he was visiting in vigorous health. He was born in England in 1826 and was first identified with the London & Southwestern Railway. He was appointed Managing Director of the Great Western of Canada in 1853 and General Manager of the Grand Trunk in 1864. He was International Railway Commissioner in 1868, and subsequently General Superintendent of government railroads.

—Mr. M. C. Kimberly, Superintendent of the St. Paul division of the Northern Pacific, succeeds Mr. N. D. Root as Assistant General Superintendent of the road. Mr. Kimberly has been connected with this road since April, 1882, and has since April, 1883, been Superintendent. He was also Resident Engineer of this road for six years to September, 1870, when he became Engineer of the Missouri, Kansas & Texas, and in 1881 again joined the Northern Pacific. In April, 1882, he was appointed Division Superintendent of the Denver & Rio Grande and in April, 1883, again returned to the Northern Pacific.

—Mr. N. D. Root, Assistant General Superintendent of the Northern Pacific, died at Tacoma, Wash. Ter., Feb. 14, from an injury received the day before, while inspecting, with a party of officers, the operation of a ballast unloader. Mr. Root was born in New York 39 years ago, and in 1864 became telegraph operator for the Chicago & Northwestern, at Council Bluffs. He was successively Train Dispatcher for the Chicago, Burlington & Quincy, Michigan Central, and Northern Pacific. On the latter from 1881 he was Train Master and Chief Train Dispatcher. He was subsequently promoted to Assistant Superintendent of the Minnesota & St. Paul Divisions. When Mr. Ainslie was made Superintendent of the Minnesota & St. Paul Divisions Mr. Root succeeded him as Superintendent of the Yellowstone Division, and in Oct., 1887, again succeeded Mr. Ainslie when the latter was made Assistant General Manager. Dec. 15, 1888, Mr. Root became Assistant General Manager of the Middle Grand Division, with headquarters at Helena. On Feb. 1, 1889, when the Grand Divisions and offices were abolished, Mr. Root was made Assistant General Superintendent, with headquarters at Helena. When injured he was at Tacoma on his first tour of inspection.

—Mr. Edward S. Philbrick, well known as a civil engineer throughout the country, and especially in the Eastern states, died very suddenly Feb. 13, while on a train returning to his home in Brookline, a suburb of Boston. Mr. Philbrick was born in Boston Nov. 20, 1827, and was a graduate of Harvard University (class of 1846). Soon after finishing his course in college he traveled extensively in Europe, Egypt and the Holy Land. His early professional experience was in the construction of railroads in Vermont and New York. Subsequently he was Assistant Superintendent and Engineer of the Boston & Worcester Railroad (now part of the Boston & Albany), and when the great increase of traffic rendered extensive improvements necessary he was appointed Consulting Engineer of the Boston & Albany road, and in that capacity had charge of replacing its wooden bridges with iron ones and building the large Union Station at Worcester, grain elevators and other structures. Among the numerous bridges on the line that at Springfield over the Connecticut River, was notable as a prominent example of the riveted lattice type of bridge, which he favored in preference to the pin-connected. The most widely-known work with which he was connected was the Hoosac Tunnel. This was begun by a corporation which received several million dollars in loans from the state, but completed only a small portion of the work. The state, after taking possession, let the contract for its completion, and Mr. Philbrick was soon after appointed consulting engineer to the Governor and Council. He continued in that relation till the tunnel was opened and subsequently had charge of a large amount of additional work connected with it. Another work of magnitude was the improvement of South Boston Flats, consisting of building sea-walls and filling the territory to grade. Mr. Philbrick had charge of this in behalf of the state. The filled territory now forms part of the terminal facilities of the New York & New England Railroad, and provides wharves and docks for ocean steamers scarcely more than a half mile from the post-office. These sea-walls are among the most substantial of their kind in the country. The construction of water-works for the town of Brookline, where his home always was, and the building of numerous bridges for street and railroad service, were additional parts of his professional work. As a sanitary engineer he had a wide reputation, and was esteemed

one of the highest authorities. Possessed of ample means, he was free from all ostentation, and while professional duties and the care of his property and trust funds engrossed much of his time, there were many enterprises of a benevolent nature, or such as aimed to promote the general welfare that received his devoted support. Well known among these is the Massachusetts Institute of Technology, of whose government he had for many years been an active member.

—Richard Peters died at his home in Atlanta, Ga., on the morning of Feb. 6, 1889, in his 79th year. His death follows within two weeks after that of his old friend, Samuel M. Felton, and so have passed away two more of the pioneers of our railroad system. At the time of his death, Mr. Peters was a director of the Western & Atlantic Railroad, and a member of the Executive and Finance Committees of that board, having been one of the original lessees of the road. He was also President of the Atlanta Street Railroad, and an incorporator of the Atlanta & Alabama Railroad.

Born in Germantown, near Philadelphia, Pa., Nov. 10, 1810, a grandson of Judge Richard Peters, of Belmont, and of David H. Conyngham, Esq., of Philadelphia, Richard Peters had in his veins the blood of a sturdy race that had always stood well in the world. He studied engineering in Philadelphia, and in 1830 began work under William Strickland, the celebrated engineer and architect of that city, continuing with him about a year in his office and as an assistant on the Delaware Breakwater. In 1831 he was employed by Major Wilson on the Camden & Amboy Railroad, and served as a rodman under the late J. Edgar Thompson, between Amboy and Bordentown, but left there to accept a better position under Major Wilson on the Philadelphia & Lancaster Railroad (now part of the Pennsylvania).

While on this road he was located part of the time at Downingtown and part of the time at Coatesville, and was in charge of the construction of the large viaduct at the latter place, building in 1834 the piers that now support the iron bridge of the Pennsylvania Railroad. In February, 1835, he accepted the position of Principal Assistant Engineer on the Georgia Railroad under Mr. J. Edgar Thompson, and joined the latter near Augusta, Ga., where he was placed in charge of the location of the road from Augusta to Athens. In October, 1837, he was made superintendent of the completed portion of the line, remaining in that position, with headquarters at Augusta, until 1845, when the line was completed to Atlanta. In that year he removed to Atlanta, when he was made director and put in charge of the bank and other interests of the road in Atlanta, which position he held continuously until 1871, during which time he exercised a general supervision over the construction and operation of the Atlanta & West Point Railroad, which was controlled by the Georgia Railroad & Banking Co. While Mr. Peters was Superintendent of the Georgia Railroad, he organized and operated a stage coach line between Madison, Ga., and Montgomery, Ala., transporting passengers, mail and express. This line was owned and operated by him until it was gradually wiped out by the building of the railroads, after which it was transferred to Montgomery and Mobile, between which points it was operated until broken up by the Confederate Government in 1861.

In addition to his railroad work, Mr. Peters conducted an experimental stock and agricultural farm in North Georgia from 1847 to the day of his death. It was here he first introduced to America the Cashmere or Angora goat, having imported them from Turkey, and from his flocks have been stocked the large goat farms of California and Texas.

Mr. Peters was married in Atlanta, Ga., in 1846, to Mary J. Thompson, who survives him with seven children, four sons and three daughters. Of his sons, Richard Peters, Jr., who married a daughter of the late Samuel M. Felton, is Secretary of the Chester Rolling Mill Company, at Thurlow, Pa.; Ralph Peters, Superintendent of the Little Miami Division of the Pennsylvania lines, Cincinnati, O.; Edward C. Peters, Superintendent of the Atlanta Street Railroad, and C. Quintard Peters, with the Iuman Cotton Company, Atlanta, Ga. Mr. Peters left an estate valued at a million dollars.

ELECTIONS AND APPOINTMENTS.

Adirondack.—At a recent meeting of the Board of Directors, William L. Strong was elected Vice-President, and he entered upon the duties of that office. C. E. Durkee has been appointed Auditor and Paymaster, with headquarters at Saratoga Springs, N. Y., appointment taking effect March 1. J. M. Ziegler has been appointed Superintendent and Passenger and Freight Agent, with headquarters at Saratoga Springs, N. Y., to succeed C. E. Durkee, promoted.

Alberta Railway & Coal Co.—The incorporators of this Canadian company are: Sir A. T. Galt, Sir Roderick Cameron, New York; W. M. Ramsey, Montreal; W. G. Conrad, Fort Benton, Mont.; T. Hauser, Helena, Mont., and others.

Assiniboia, Edmonton & Unjiga.—The incorporators of this Canadian road are: Hon. H. E. Wilson, A. J. Patterson, T. B. Lee, H. J. Dennis, R. McCleary and J. R. Roof.

Atchison Union Depot Co.—The annual meeting of the Company was held, Feb. 13, and the following Directory was elected: W. F. Merrill, Kansas City, St. Joseph & Council Bluffs; A. W. Dickinson, Missouri Pacific; C. H. Rathburn, Central Branch Union Pacific; Winslow Judson, St. Joseph, St. Louis & Santa Fe; S. E. Crance, Hannibal & St. Joseph; G. W. Holbridge, Burlington & Missouri River; A. A. Robinson, Atchison, Topeka & Santa Fe. W. F. Merrill was elected President, and F. W. Downs, Secretary and Treasurer. W. F. Merrill, C. H. Rathburn and A. A. Robinson were appointed a building committee to take charge of the new building, work upon which is to commence at once.

Avon, Genesee & Mount Morris.—At the recent annual meeting held in Rochester the following officers were chosen: President, Mortimer F. Reynolds; Vice-President, H. P. Mills, Secretary and Treasurer, George W. Phillips; Trustees, Mortimer F. Reynolds, George Ellwanger, Josiah Anstice, L. A. Ward, George W. Phillips, A. E. Brown and H. P. Mills.

Bedford & Bridgeport.—The following directors were elected at the annual meeting held this week: R. D. Barclay, President; W. W. Barclay, J. N. Dubarry, John I. Green, William M. Hall, John G. Hartley, H. H. Houston, Wistar Morris, William A. Patton, G. B. Roberts, S. L. Ruessel, N. Parker Shortridge and Henry D. Welsh.

Burlington & Missouri River.—F. S. Granger has been appointed Assistant Superintendent of the Southern Division, with headquarters at Edgar, Neb. E. F. Higland has been appointed Roadmaster, with headquarters at Nebraska City, Neb. C. W. Hobans, Roadmaster, has had his division extended, and his headquarters are at Tecumseh, Neb.

Cairo, Vincennes & Chicago.—The first board of directors of the reorganized company is composed of Llewellyn Thomas, M. A. McDonald, J. J. Fletcher, C. S. Elliott and C. E. Doyle. At a meeting of the board of directors Llewellyn Thomas was elected President, Malcolm A. McDonald General Manager, and J. W. Elliott Secretary and Treasurer.

Centralia & Chester.—W. T. Wylie, of Sparta, Ill., and

J. C. McCutcheon, of Monmouth, Ill., have been re-elected as directors for the ensuing year.

Chattanooga & Augusta.—The incorporators are E. M. Kilpatrick, R. C. Bowie, James Parks, L. Shugart and I. J. Stamper. The offices are at Ducktown, Ala.

Chicago, St. Paul & Kansas City.—W. R. Busenbark, Assistant General Passenger Agent of the Michigan Central, has accepted the position of General Passenger Agent of this road. The appointment takes effect March 1, on which date the general passenger department will be removed to Chicago. J. H. Veitch has been appointed General Agent at Kansas City, in place of J. H. Hyland, who has been appointed General Freight Agent.

Cincinnati, New Orleans & Texas Pacific.—The old board of directors was re-elected at the annual meeting held in Cincinnati, Feb. 18.

Concord & Portsmouth.—At a special meeting of the directors of the road, John J. Pickering, of Portsmouth, was elected President to fill the vacancy made by the death of the late Hon. Samuel N. Bell.

Delaware.—At a special meeting of the directors of the road, held this week, Christian Febiger, of Wilmington, was elected President, vice Samuel M. Felton, deceased.

Delaware, Lackawanna & Western.—At the annual meeting of the company, Feb. 19, Jay Gould retired from the board of directors on account of ill health, and Henry A. C. Taylor was elected his successor.

Great Eastern.—The annual meeting was held in Montreal, Feb. 5, and the following directors were elected: James Cooper, A. B. Chaffee, F. Vanasse, C. B. Carter, C. Tetu, M. S. Loneragan, T. T. Turnbull. Mr. James Cooper was re-elected President, and A. D. Chaffee, Vice-President.

Hannibal Union Depot Co.—The following directors were elected last week: E. P. Ripley, Chicago, Burlington & Quincy; S. E. Crance and W. J. Hilton, Hannibal & St. Joe; C. M. Levy, the St. Louis, Keokuk & Northwestern; J. J. Frey, the Missouri, Kansas & Texas, and G. K. Tozer, Wabash. The following officers were elected: E. P. Ripley, President; W. J. Hilton, Secretary and Treasurer; C. N. Lee, Superintendent.

Houston, Central Arkansas & Northern.—The officers are: President, W. A. Bright; Vice-President, R. B. Blanks; Secretary and Treasurer, A. W. Files; Chief Engineer, C. G. Woodbridge. The general office is at Monroe, La.

Huntingburg, Tell City & Cannellton.—At the annual meeting held at Cannellton, Ind., Feb. 14, all the old officers and directors were re-elected.

International & Great Northern.—Thomas R. Bonner and N. W. Finley, of Tyler, Tex., have been appointed Receivers of the road.

Iowa Falls & Sioux City.—At a meeting held in Dubuque, Ia., Feb. 11, the old board of directors was re-elected, with the exception of E. T. Jeffrey and John Elliott, who were succeeded by John Anthon and H. F. Webster.

Kankakee & Northern.—The incorporators of this Illinois company are: Charles Denehy, Charles E. Rollings, Cornelius Ryan and John N. Summers, all of Chicago.

Kansas City Circle.—At a recent meeting of the company the following officers were elected: E. F. Rogers, President; L. G. A. Copley, Secretary and Treasurer; William B. Knight, General Manager and Chief Engineer, all of Kansas City, Mo.

Kansas City, El Paso & Mexican.—At the recent annual meeting in El Paso, Tex., directors were elected as follows: B. H. Davis, Joseph Magoffin, C. R. Moorehead, Zeno B. Clardy, L. B. Freudenthal, B. C. Lightbody, John Julian, all of El Paso. Officers were elected as follows: B. H. Davis, President; Zeno B. Clardy, Vice-President; Henry Nevins, Secretary; S. W. Russell, Treasurer; W. C. Masten, General Manager; H. V. Estill, Chief Engineer.

Kansas City, Fort Scott & Memphis.—O. G. Parsley, Jr., has been appointed Division Freight Agent, with headquarters at Memphis, vice E. A. Thurston, transferred. L. R. Van Diviere has been appointed Southeastern Freight Agent, with headquarters in Atlanta, vice O. G. Parsley. The appointments are for the Kansas City, Fort Scott & Memphis, Kansas City, Clinton & Springfield, and Kansas City, Memphis & Birmingham roads.

Los Angeles & Pacific.—R. C. Shaw, General Manager, has been appointed Traffic Manager, and the duties of the General Manager have been assumed by the President E. E. Hall.

Louisiana North & South.—At the recent annual meeting in Gibsland, La., the following directors were elected: A. D. Hammett, G. G. Gill, J. A. Richardson, W. G. Darley, W. L. Kidd and W. B. Colbert. Officers elected: A. D. Hammett, President; J. D. Beardsley, General Manager; W. G. Darley, Secretary; G. G. Gill, Treasurer.

Louisville Southern.—John Jerome has been appointed Chief Train Dispatcher at Louisville, Ky.

Lowell & Andover.—The annual meeting of the stockholders was held at Lowell, Mass., Feb. 13, and the old board of directors were unanimously re-elected as follows: Frederick Ayer, George Ripley, F. F. Ayer, A. P. Bonney, J. T. Furber, O. H. Moulton, Benjamin Walker, E. M. Sargent and P. C. Gates. Frederick Ayer was chosen President, and Benjamin Walker Treasurer and Clerk.

Michigan Central.—George E. King, for some time past Assistant General Ticket Agent, has been appointed Assistant General Passenger and Ticket Agent, the two positions being consolidated. The change will take effect March 1.

Mifflin & Centre County.—J. N. Dubarry, Alexander Biddle, G. W. Elder, John P. Green, R. H. Lee, Amos R. Little, James H. Mann, Wistar Morris, William A. Patton, G. B. Roberts, N. Parker Shortridge, Henry D. Welsh and W. H. Wilson were elected directors at the annual meeting held this week.

Montgomery & Sylacauga.—The organization of this new Alabama road was perfected last week by the election of the following directors and officers: J. W. Pimmick, H. G. McCall, Joseph Goetter, B. Dunham, W. F. Vandiver, J. M. Carr, Peter Buyck, M. B. Houghton, H. A. Jones, J. A. Parker, George A. Hill, A. M. Baldwin, J. T. Parker, J. L. Williams, M. B. Houghton, President; H. G. McCall, Secretary, and H. A. Jones, Treasurer. Offices, Montgomery, Ala.

National City & Otago.—This railroad is hereafter to be operated independently, instead of by the San Diego Land & Town Co., as heretofore. The general executive offices of the road will be located in Boston. George J. Lockie, the Superintendent, will represent the executive management in California, and will have general charge of the operating and traffic departments of the road. He will, until further orders, assume the title of Acting General Manager. Henry Gray, Assistant Treasurer, with office at

National City, will have charge of the finances of the company in California, reporting to the Treasurer at Boston.

Newport News & Mississippi Valley.—W. F. Prouty, late Chief Clerk in the Cincinnati, Hamilton & Dayton General Passenger Department, at Cincinnati, O., has been made General Passenger Agent of the Western Division, with headquarters at Louisville, Ky.

New York & New England.—John N. Ross has been appointed Train Master of the Eastern Division, and will report to the Superintendent. George Robidou has been appointed Chief Train Dispatcher, in place of John N. Ross, promoted.

Northern Central.—The board of directors this week elected Col. E. P. Parsons, of Sodus Point, a director to succeed Dell Noblit, resigned. J. D. Cameron has also been elected a director, to succeed Edmund Smith, resigned.

Northern Pacific.—M. C. Kimberly, Superintendent of the St. Paul Division, has been appointed Assistant General Superintendent of the road, to succeed N. D. Root, who died at Tacoma, Feb. 14.

Santa Clara Belt.—The directors of this California company are M. H. Turrill, A. Malpas, J. Champion, G. T. Bigelow and B. Radovich.

Scioto Valley.—The stockholders held their annual meeting in Columbus, O., Feb. 14, and re-elected the following directors: F. H. Davis, George Watkins, Horace Porter, E. F. Winslow, New York; Marcus Boggs, Chillicothe, O.; George Davis, Portsmouth; W. W. Franklin, Columbus; John Grace, Circleville; D. Weigand, Bloomfield.

Southwestern (Georgia).—At the annual meeting held last week the following board of directors was elected: J. E. Jones, Virgil Powers, John S. Baxter, W. G. Raul, John I. Grisham, L. A. Jordan, of Macon; H. M. Comer, E. P. Alexander, of Savannah. At a meeting of the directors John E. Jones was re-elected President, and William S. Brantley Secretary and Treasurer.

Utah & Arizona.—The following officers have been chosen for this extension of the San Pete Valley road: Theodore Bruback, President and General Manager; J. B. Blair, Vice-President; H. S. Kerr, Treasurer, and R. L. Scannell, Secretary. The office of the company is at Salt Lake City.

West Virginia, Pineville & Tennessee.—The following officers have been chosen: H. V. Loring, President; Thomas C. Bell, Vice-President, and J. B. Holloway, Secretary.

OLD AND NEW ROADS.

New Companies Organized.—Chattanooga & Chattanooga, Missionary Ridge & Chickamauga. Kankakee & Northern. Petaluma, Sebastopol & Russian River.

Addyston & Ohio River.—This company has filed a charter in Ohio, with a capital stock of \$50,000.

Alabama Midland.—About 1,600 men are now engaged in grading the road between Bainbridge, Ga., and Troy, Ala., and every effort is being made to push the work to an early completion. The iron draw bridges over the Flint and Chattahoochee rivers will be erected by May 1, but in the meanwhile false bridges will be erected, and track laying will soon be in progress west from the Chattahoochee River; already some track has been laid between Bainbridge and the river. Steel rails are constantly arriving, and the equipment for 75 miles of road has been received. This includes four locomotives and over 100 cars. H. C. Griffin, the contractor for tracklaying, has purchased a McFadden tracklaying machine. The line is to be completed to Troy by August 1, and to the connection with the Northwest and Florida road, which connects the line with Montgomery by Sept. 15.

Alberta Railway & Coal Co.—A bill incorporating this company has passed its second reading in the Dominion Parliament. The company is to construct a line from a point on the road of the Northwestern Coal & Navigation Co., between Dummore and Lethbridge, southerly to the United States boundary, to connect with the railroad system of Montana. The capital stock is \$300,000, and bonds may be issued at the rate of \$15,000 per mile of completed road.

American Midland.—A large force of men is reported at work building culverts and laying ties from Glendora, O., westward toward Fort Wayne, Ind., about 50 miles. Glendora is just west of Ottawa, and is the present end of track on the western end of the line. It is claimed that tracklaying will be completed to Fort Wayne by May 15. The contract for the building of the principal repair shops, which will be at Fort Wayne, has just been let for about \$200,000, and an arrangement is said to have been entered into with a car building company in the East to establish a Western branch in connection with the shops.

Anniston & Montgomery.—Two surveying parties for this road, under charge of C. C. Wrenshall, of Anniston, Ala., are now in the field working from Anniston and from Montgomery. The former party is about 20 miles south of Anniston and the latter has surveyed to beyond Wetumpka, about 12 miles north of Montgomery. The line of the proposed road is from Anniston to Lineville, to Alexander, to Wetumpka, and thence to Montgomery. The air-line distance from Montgomery to Anniston is 102 miles, and the route of the proposed road will be about 110 miles.

Assiniboia, Edmonton & Unjiga.—A bill incorporating this company has passed its first reading in the Dominion Parliament. The capital stock is to be \$4,680,000, with power to issue bonds at \$20,000 per mile of constructed road. The road is to start at Swift Current, Assiniboia, on the Canadian Pacific, thence northwesterly, crossing the South Saskatchewan River near the junction of the Red Deer River, thence northerly to the main Saskatchewan, Edmonton and Smoky River.

Atchison, Topeka & Santa Fe.—The directors have published a revised statement, which in addition to the facts given in the account published in the Railroad Gazette of Feb. 1 shows a summary of fixed charges for the year 1889. They are as follows: Total interest, \$8,750,365; total sinking funds, \$358,886; total taxes, \$1,220,934; total net rentals, \$501,633; total of all, \$10,831,198. Add direct interest on equipment lease warrants, \$1,445,660, at 6 per cent., \$86,739, making a grand total of \$10,918,558. The direct charges are exclusive of \$161,805 interest on land grant mortgage bonds, which is payable from land receipts, and include full interest on \$7,000,000 guaranteed fund notes at 6 per cent., although only \$2,800,000 had been issued in January, 1889. The total charges include the interest on the Gulf Division, and Atlantic & Pacific bonds, and one-half the bonds of joint mileage, including one-half the rental of the Mojave Division of the Atlantic & Pacific.

Atlantic & North Carolina.—The company is to apply to the North Carolina legislature for a charter to extend its road from the present western terminus at Goldsborough to Charlotte. Stock is to be issued to an amount not exceeding \$600,000 and the existing road is to be bonded at not

more than \$8,000 per mile to provide funds for this extension and for betterments to the road.

Baltimore & Drum Point.—The contractors on this Maryland road are Rogers & Clement and Watson, Walsh & Foley, and they are at work on the 44 miles of uncompleted road between Baltimore and Drum Point, in Calvert County. In Calvert County 23 miles of grading, and in Anne Arundel County 13 miles, have already been completed. Drum Point, the southern terminus, is one of the finest harbors on the Atlantic coast. The branch from Conways, on the main line, to Washington, is now under survey.

Brantford, Waterloo & Lake Erie.—The contract for the construction of this road has been let to Nihan, Elliott & Battle, of St. Catherine, Ont.

Cairo, Vincennes & Chicago.—This road, which is formed of lines comprising what was formerly the Cairo division of the Wabash, St. Louis & Pacific, and has since April, 1885, been operated by the receivers of the court, is to be reorganized under the above name. The holders of the entire \$3,857,000 of bonds issued by the Wabash, St. Louis & Pacific on its Cairo division have assented to the reorganization.

Central Pacific.—A decision of the Court of Claims giving judgment for \$1,002,517 in favor of the Central Pacific Co. in its suit against the United States has been handed down. The suit was an adjustment of the accounts of the company based on previous decisions of the Supreme Court. The judgment represents the amount due the company for Government transportation over its non-aided roads, and also the amount of certain payments made in excess of the requirements of the Thurman act.

Central Vermont.—Work will probably begin early next spring on an extension from Waterbury to Stowe, Vt., a distance of 8 miles. Local aid to the extent of \$40,000 has been secured.

Chattanooga & Augusta.—This company has been granted a charter in Alabama, authorizing the construction of a line from Chattanooga, Tenn., to the Ocoee River, in Polk County, thence along the river to the Ducktown copper mines in the same county, and from there to the Tennessee boundary line. It is also proposed to build a branch from there to Savannah Farm, in Polk County.

Chattanooga, Missionary Ridge & Chickamauga.—A company was last week organized at Chattanooga, Tenn., to build a road from Chattanooga to the Chickamauga battle-field, a distance of eight miles, to the top of Missionary Ridge, and along the ridge to Chickamauga, an entire distance of about twelve miles.

Chicago, Madison & Northern.—A temporary injunction has been granted at Chicago on the petition of the Chicago, Burlington & Quincy restraining the Chicago, Madison & Northern from laying tracks across the line of the Chicago, Burlington & Quincy at Clyde, Ill. Clyde is nine miles west of Chicago, where 50 trains pass each way daily, including a large number of suburban passenger trains. The Burlington all gets that this traffic would be delayed and the danger to passengers increased. The new road should be compelled to build an overhead bridge, which can be done without damage to surrounding property. Complainant is of opinion that Illinois should adopt the progressive policy of England and Massachusetts concerning grade crossings.

Chicago & Western Indiana.—The stockholders of the company have adopted resolutions providing for the issue of six per cent. bonds to the amount of \$1,000,000, secured by mortgage to Anthony J. Thomas and Charles Tracy as Trustees. The proceeds are to be applied to enlarging, completing, improving and operating the road, for the purchase of additional right of way and for the erection of buildings.

Chowan & Southern.—The name of this road has been changed to the Norfolk & Carolina.

Cincinnati Southern.—A bill, now before the Legislature of Ohio, to authorize the renewal and extension of the lease of the road for 30 or 40 years, is arousing considerable discussion in Cincinnati. The Chamber of Commerce of that city appointed a committee to investigate the matter. The committee submitted two reports; the majority reported in favor of giving power to extend the lease at a minimum annual net rental of \$1,250,000. The minority report also favored the lease of the road on the same terms, but recommended the bill to contain an option of selling the road at a minimum price of \$29,000,000. The Cincinnati Southern, as is well-known, is owned by the City of Cincinnati, and is leased at a graded rental to the Cincinnati, New Orleans & Texas Pacific, which has invested upward of \$3,500,000 in permanent improvements.

Covington & Macon.—Right of way is being obtained for a projected extension from a point on the main line at near Monticello, Ga., west about 30 miles to Griffin, in Spalding County, on the Central of Georgia and the Georgia, Midland & Gulf.

Craig Mineral.—The surveys for this road are now in progress between Eagle Rock and Newcastle, Va. The contract for building the entire line has been let to the Sears Construction Co., of which W. G. Sears, of Eagle Rock, Va., is General Manager. Sub-contracts will be let about April 1. F. A. Cooper, of Eagle Rock, is Chief Engineer.

Decatur & South Mountain Mineral.—It is stated that a company has been formed in New York to construct this line, and that work will begin at Decatur, Ala., as soon as the right of way through the city has been granted. The line will be about 10 miles long, and it is claimed will be completed within a year. The cost is estimated at \$100,000.

Dexter & Piscataquis.—It is expected to begin grading on this Maine road by March 30. It is to extend from Dexter to Dover, 16 miles. The general contract has been let to J. B. Brown & Co., of St. Stephen, N. B., and they are now letting sub-contracts.

Duluth & Winnipeg.—The North Star Construction Co. has been organized at St. Paul by W. H. Fisher, W. A. Barr, Donald Grant and others interested in this company to build the entire road. The capital stock is placed at \$1,000,000. The survey for the road is now completed as far as Grand Rapids, Minn., near the source of the Mississippi, and about 80 miles from Duluth.

Evansville & Terre Haute.—It is announced that this company has practically secured control of the Louisville, Evansville & Terre Haute and the Illinois & St. Louis roads, although some details yet remain to be settled. The main line of the former road extends from New Albany, Ind., to Mt. Vernon, Ill., 182 miles, and with branches operates 283 miles. The Illinois & St. Louis operates 25 miles of road, the main line extending from Belleville to East St. Louis, Ill., 15 miles. It is stated that the gap between Belleville and Mt. Vernon, to connect the two acquired lines, will be built this year.

Florence Northern.—The contract to build 75 miles of the road, from Florence, Ala., to Linden, Tenn., where it intersects the Tennessee Midland and Illinois Central roads, has been awarded by Chief Engineer A. G. Negley to J. B. Neely, of Chattanooga, John Smith, Jr., of Nashville, E. A. Wilson, of Luray, Va., and M. Tabler of Harrodsburg, Ky., under the firm name of Neely, Smith & Co., with offices at Florence, Ala. This contract embraces grading, masonry, trestling, tracklaying, bridging and ballasting, the work to commence immediately, 25 miles to be completed in four months, and the remaining 50 this year.

Florida Central & Peninsula.—I. B. Newcombe & Co. of New York, offer to investors at par and accrued interest, \$1,150,000 first mortgage 5 per cent. gold bonds of the company, due in 1918, being the unsold portion of an issue of \$3,000,000. The company is the successor to the Florida Railroad and Navigation Co., sold under foreclosure in 1888. The bonds offered are a first and only lien, issued at the rate of \$5,226 per mile. Under the receivership \$1,500,000 was expended for improvement of property, and there still remains \$900,000, raised by assessments from the old security holders, to be expended for additional equipment and betterment.

Georgia.—The company is building a branch from Union Point, in Greene County, Georgia, southwest to White Plains, in the same county, a distance of about 13 miles. The road is being built under a separate charter, and John Hart, of Union Point, is President. The right of way for the entire line was given and \$10,000 in money was subscribed to build the branch. About six miles of the grading was completed by a local company, when it was unable to meet its obligations.

Georgia Pacific.—On the extension from Columbus, Miss., west to Winona and Greenwood, nearly all the grading is now finished, and considerable track has been completed. As soon as the bridges have been placed in position more rapid progress in tracklaying will be made. It is expected to open the line by July 1, giving the Georgia Pacific a continuous line from Atlanta through Birmingham to the Mississippi River at Greenville.

Grand Rapids & Indiana.—The company has engineers now in the field surveying an extension to Ludington, Mich., which it is expected to build this year. The Big Rapids & Western lumber road, owning 13 miles of track, has been purchased by the company and will be used in the extension.

Houston, Central Arkansas & Northern.—The Reynolds & Henry Construction Co. is the name of the construction company, referred to last week, which has been organized to build this road from Pine Bluff, Ark., to Houston, Tex., 484 miles. The company is now grading the first 35 miles from Monroe, and it is expected to have 50 miles completed by July 1. The general offices of both railroad and construction companies is at Monroe, La.

Indianapolis, Decatur & Western.—Grading on the extension from Decatur to Beardstown, Ill., is expected to begin in a few months. The survey has been completed from Decatur to Petersburg, on the Chicago & Alton road, and 26 of the 30 miles have been located.

International & Great Northern.—The road has been placed in the hands of receivers as a result of two suits filed against the company recently, one for \$496,990 by Jay Gould for money advanced, and one for \$1,000,000 by the Missouri, Kansas & Texas. The International & Great Northern runs from Longview to Houston, Tex., 232 miles, and from Palestine to Laredo, Tex., 415 miles; there are 128 miles of branches and 50 miles of leased road, making a total of 825 miles operated by the company. The Missouri, Kansas & Texas purchased the road in 1881, each stockholder of this road receiving for each share held by him two shares of the Missouri, Kansas & Texas. The company is a consolidation of the International, chartered in 1870 and opened to Longview in 1872, and the Houston & Great Northern, opened to Palestine in 1872. In April, 1878, at the suit of the second mortgage bondholders, the road was placed in the hands of a receiver and it was reorganized by a committee of the bondholders. By the terms of the reorganization, holders of the old Houston & Great Northern bonds received \$1,279, and holders of the old International bonds \$1,294, for each \$1,000 bond. Payment was made, one-half in new first mortgage 6 per cent. bonds and one-half in new second mortgage 8 per cent. income bonds. The total issue of new first mortgage bonds to bondholders was \$4,724,000 and for the secured debt \$900,000, or \$9,624,000 in all. Of the new second mortgage income bonds \$4,724,000 were issued to bondholders. The capital stock of the road is \$9,755,000, and the funded debt \$15,008,000. The total liabilities are \$28,392,874.

Arguments were heard last week in New York, on a motion by the Receivers of the Missouri, Kansas & Texas, to order the Missouri Pacific to transfer to the Missouri, Kansas & Texas the stock of this road which the Missouri Pacific holds. The former road claims that it owns the stock, and the latter that it holds it under an order of the court. The object is to secure the voting power on the stock at the next annual election.

Kanawha & Ohio.—Suit was entered this week at Charleston, W. Va., asking for the appointment of a receiver for the company, which operates a line between Corns, O., and Charleston, W. Va., a distance of 126 miles. The Mercantile Trust Co., of New York city, filed a bill in equity asking foreclosure of the mortgage, of which it is trustee. The amount of the default is \$500,000, consisting of overdue interest, floating debt, taxes, etc. Robert W. Kelley, New York, President of the company, was appointed Receiver.

Kankakee & Northern.—Articles of incorporation of the company have been filed in Illinois. The line is to be constructed from Kankakee, Iroquois County, to Harrington, Cook County. The principal business office will be in Chicago, and the capital stock is placed at \$2,000,000.

Kansas City Circle.—This company has been organized to construct a double track railroad around Kansas City, Mo. The length of the line to be constructed immediately is about 25 miles. W. B. Knight, of Knight & Bontecou, of Kansas City, is General Manager and Chief Engineer.

Kansas City, Ft. Smith & Southern.—The company is filing in the counties in Missouri through which the road runs a copy of a mortgage for \$3,000,000. It is thought that work on the extension of the road to Fort Smith will soon be begun.

Kaskaskia, St. Elmo & Southern.—Last fall we were informed by an officer of this company that the scheme had reached that stage of development, signified by the term "busted." However true that description of the state of affairs was at the time, it would seem that its vitality was considerable, for there are now some indications that it is in a fair state of recovery, and may yet be fully revived. It is announced that tracklaying will begin in early spring on the 35 miles of graded road. The scheme is to build a

road from Altamont, Ill., via St. Elmo, Salem, Mt. Vernon and Marion, to Metropolis, Ill., opposite Paducah, Ky. The distance is 158 miles, and the line has been located with a maximum grade of 1 per cent. and with 4° curves. The right of way for 120 miles has been secured, and the city of Paducah has voted \$100,000 of bonds. The road will pass through a well timbered and good farming country, and for about 60 miles through coal fields. B. F. Johnston, of St. Elmo, is President, and James M. Browne, of 145 Broadway, New York, is Chief Engineer.

Kootenay & Athabaska.—This company seeks incorporation in Canada to construct a line from Revelstoke, B. C., to the international boundary. The capital stock of the company is to be \$1,000,000, with power to issue bonds to the extent of \$25,000 per mile. McLeod Stewart, J. Isbert, C. W. Moberly and A. McLean are the projectors.

Lancaster & Hamden.—Contracts for tracklaying on the road between Lancaster, O., and South Bloomingville, a distance of 30 miles, have been closed, and work will begin as soon as the weather permits. The company recently placed an issue of bonds in New York.

Lockport & Northern.—About \$30,000 has been subscribed to the capital stock of this company, and surveys will soon be made from Lockport north about ten miles to New Fane Station, on the Rome, Watertown & Ogdensburg. The list of directors was published in our last issue when the road was referred to under the heading of New Roads.

McKeesport & Belle Vernon.—The road was last week opened for traffic from McKeesport, southwest to Elizabeth, Pa., a distance of about seven miles.

Monongahela River.—Right of way is now being secured and surveys made for this road, which is to extend from Fairmont to Parkersburg, W. Va., 35 miles. Contracts will probably be let by April 1, and it is expected to have tracklaying in progress by July 1 and the road ready for operating by November. Hon. J. N. Camden is President and J. A. Fickinger is Chief Engineer. The general office is at Parkersburg, W. Va.

Mussel Shoals, Elk & Tennessee River.—Cutler Smith, W. P. Ragsdale, J. W. Falk and others, of Florence, Ala., have incorporated the Mussel Shoals, Elk & Tennessee River Railroad and Transfer Company, with a capital stock of \$150,000, to build a road from the Mussel Shoals in the Tennessee River via Florence to Waterloo, Ala.

New Brunswick & Prince Edward Island.—A bill reducing the capital stock of this company from \$950,000 to \$500,000 has been introduced in the Dominion Parliament. The bill also gives the company power to extend its lines from its intersection with the Intercolonial to Wood Point, N. B., and to a deep water terminus on the Bay of Fundy.

New Castle & Shenango Valley.—This road, completed some time ago between New Castle and West Middlesex, Pa., 17 miles, has been formally transferred to the New York, Pennsylvania & Ohio under a 99-year lease for 32 per cent. of gross earnings, with a minimum rental equivalent to interest on the first and second mortgage bonds. The New York, Lake Erie & Western is also a party to the lease, and guarantees payment, as lessee of the New York, Pennsylvania & Ohio. First mortgage 6 per cent. 30-year bonds to the amount of \$250,000 have been issued on the road, and the capital stock of \$250,000 has been all paid in. The road has not yet been placed in operation, owing, it is said, to a claim made by the Pittsburgh & Lake Erie that a contract made between it and the New York, Lake Erie & Western would be violated by the operation of this road.

New Roads.—A company is applying to the Maine Legislature for a charter to build a road from Springvale to Kennebunk, about 10 miles. The road will form a connecting link between the Portland & Rochester and the Boston & Maine, a short distance above Rochester. The incorporators are: R. N. Lord, of Kennebunk; Geo. H. Nowell, of Sanford; E. M. Goodall and Charles H. Frost, of Springvale.

A company is also applying to the Maine legislature to build a road from Lewiston to Auburn via East Auburn and Turner to Bretton's Mills.

New York, Lake Erie & Western.—The company has engineers in the field surveying a new line between the terminus of the Jefferson branch at Honesdale, Pa., and Susquehanna, about 20 miles. This new line would considerably shorten the main line of the road, as it would connect the line from Susquehanna to Carbondale with the Honesdale branch. The survey was started from Ararat Summit, a few miles south of Susquehanna, and will be continued southeast to Honesdale.

The litigation between the Goshen & Deckertown Co. and this company over what is known as the Pine Island Branch has been adjusted and the suit dismissed. When the company leased the Pine Island Branch it assumed the payment of \$246,500 of mortgage bonds, running 20 years and bearing 7 per cent. interest. The bonds matured July 1, 1888, and at that date the company sought to replace them with a new issue bearing only 5 per cent. interest. By the compromise the old bonds are to be refunded in a new issue of 40 year bonds bearing 6 per cent. interest.

New York, New Haven & Hartford.—The locating survey is now in progress for the new branch in Connecticut. The line will leave the Northampton road about midway between Plainville and Farmington, connecting at New Britain with the New Britain Branch. The line will be about six miles in length, and will probably be built during this coming summer. With the New Britain branch and the main line of the Hartford division it will constitute a line between Plainville and Hartford, parallel to the New York & New England. Between these points there is a considerable passenger traffic.

New York, Ontario & Western.—The stockholders have been asked to assent to the plan of the directors for providing funds for the extension to Scranton. It is proposed to issue \$10,000,000, five per cent., first mortgage, 50 year bonds, to be used for the retirement of the existing six per cent. bonds, amounting in the aggregate to \$4,000,000, for additions to the property and as a reserve for improvements and additions to the road and its equipment in the future. The extension to Scranton will be built from Hancock, N. Y., on this road, to Forest City, Pa., by the Hancock & Wyoming Valley, and from Forest City to Scranton by the Scranton & Forest City. When completed the roads will be consolidated as the Ontario & Scranton, and will form part of this company's system. The new extension will cross the main line of the New York, Lake Erie & Western at Hancock above grade over an iron bridge, which will also span the Delaware River at that point, and the track will follow a valley in a westerly direction through Wayne and Lackawanna counties, in Pennsylvania, passing through the towns of Forest City, Carbondale, Archbald and Providence, to Scranton, where the road has arranged for ample terminal facilities, and where it will make connections with the Central of New Jersey and the Delaware, Lackawanna & Western.

Norfolk & Carolina.—At a general meeting of the stockholders held Feb. 14, the name of the Chowan & Southern Railroad Co. was changed to the Norfolk & Carolina.

Northern Pacific & Manitoba.—The company is said to have submitted to the Manitoba Government a proposal to pay immediately into the Provincial treasury \$720,000 in cash, instead of in 25-year bonds, as provided in the agreement with the Province on the completion of the road. About \$400,000 expended for right of way will also probably be paid at once to the Province, and it is also stated that the company agrees to allow the Government to control in a measure all branches. Until the completion of the whole system throughout the Province there will probably be some indemnification in the matter of guaranteeing interest.

Oio Valley.—The final locating survey for the extension from Princeton southeast to Hopkinsville, Ky., on the Louisville & Nashville, has been almost completed. As soon as the extension north to Evansville, Ind., is completed work on the southern extension will be vigorously prosecuted, and it is expected to have the whole line from Evansville to Hopkinsville open early in the fall. A further extension south from Hopkinsville is said to be under consideration.

Oneonta & Richfield Springs.—The engineers are now finishing the location of this road from Oneonta north through Laurens and South Hartwick to Richfield Springs, N. Y., 32 miles. As soon as the location is finished, bids for constructing the line will be received. It is expected to begin tracklaying in July and have the line open for traffic in December. An issue of \$450,000, five per cent. 40 year bonds, will be made. The capital stock is \$75,000 and is being subscribed along the route.

Pana & Roodhouse.—Surveys for this road have been made from Pana, Ill., via Morrisonville and Scottville, to Roodhouse, about 70 miles. It is expected to let the contracts in the spring.

Pennsylvania.—The company has placed with Drexel & Co. about \$5,000,000 of United Railroads of New Jersey general mortgage four per cent. bonds at a price over par. The proceeds will be used to pay off the six per cent. bonds falling due in June and November of this year. All the debt of the New Jersey system, except two loans aggregating \$3,646,000, will then be included under the general mortgage.

It is stated that the company has secured nearly all the right of way for a proposed extension of the Philadelphia, Marlton & Medford road from Medford southeast to Manahawken and Long Branch, N. J., on the Atlantic seacoast. The extension, if built, would be about 35 miles long, and would give the company another line to the New Jersey seashore. It is also stated that the company proposes, by filling in several gaps, to make a continuous line along the New Jersey sea shore from Sandy Hook to Cape May Point.

Petaluma, Sebastopol & Russian River.—A company has been organized in California to build a road from Petaluma northwest to Guerneville. Both points are on the San Francisco & North Pacific road. One hundred thousand dollars has been subscribed, and the company will soon be incorporated.

Philadelphia & Reading.—This company has instituted suits against the Philadelphia, Newtown & New York, a 20 mile controlled line, extending from Philadelphia to Newtown, Pa., for \$514,000, covering amounts advanced on various accounts since 1879. It appears that this action is in preparation for a foreclosure suit. The Reading is understood to hold a little more than one-half of the stock and about a third of the bonds of the controlled company. Surveyors are running a line between Newtown and the Delaware River, and this with other circumstances is rumored to indicate that the road may be sold to the Baltimore & Ohio.

Port Jervis, Monticello & New York.—The suit of this road against the New York, Lake Erie & Western was brought before the Supreme Court, at Newburg, this week. This case is brought to recover damages for the alleged loss of business in having terminal facilities cut off at Port Jervis. After testimony showing the agreement made 20 years ago, between plaintiff's official board and the New York, Lake Erie & Western as to the terminal facilities, the case was postponed until March 8.

Port Townsend Southern.—Contracts are to be let immediately for constructing the first 25 miles south from Port Townsend, Wash. Ter., toward Portland, Ore. R. E. Andrews, of Port Townsend, is Chief Engineer.

Quebec & Lake St. John.—A London cable states that the Railway Trust Agency Co. has invited subscriptions for £780,000 five per cent. first mortgage bonds issued at 96, the Quebec Government guaranteeing interest for ten years.

Richmond, Nicholasville, Irvine & Beattyville.—The contract for that portion of the line between Richmond, in Madison County, Ky., and Nicholasville, in Jessamine County, Ky., was last week let to D. Shanahan & Co., of Louisville, Ky. Other contracts will be let this week. The distance already let is 25 miles, and it is to be ready for operation by Sept. 1.

Richmond & West Point Terminal.—The suit brought in the Chancery Court at Knoxville, Tenn., against this road and the East Tennessee, Virginia & Georgia, to prevent the former road from leasing the latter, has been removed to the United States Circuit Court, for the eastern district of Tennessee. The removal was on the petition of President John H. Inman of the Richmond Terminal, who stated that from prejudice and local influence the company would not be able to obtain justice in the Chancery Court at Knoxville or any other State court.

The company is soon to issue new bonds covered by a mortgage for \$25,000,000 on the roads controlled by the company. Of this, it is understood that \$5,000,000 of the new bonds are to provide the means for paying for the Central of Georgia and to take up the floating debt; \$6,200,000 to be set aside and held by the trustee to redeem the bonds of the old issue; \$700,000 will be set aside and held to exchange for the Richmond & Danville stock, which is still outstanding; \$5,000,000 will be held to exchange for the Terminal preferred stock; and \$1,500,000 will be held to exchange for the East Tennessee, Virginia & Georgia first preferred stock, of which it is understood that \$3,500,000 is still outstanding.

Rupert & Bloomsburg.—It is stated that the contract for building this short connecting link of the Philadelphia & Reading between Rupert and Bloomsburg, Pa., has been let to John Jameson, of Bloomsburg.

St. Louis, Arkansas & Texas.—The extension northward toward St. Louis was placed in operation from Malden, to Delta, Mo., Feb. 17. Trains enter St. Louis over the St. Louis, Iron Mountain & Southern. The stations on the new portion of the road, with distances from Malden, are as follows: Bernie, 7 miles; Dexter, 16; Idalia, 28; Day, 29; Ardeola, 35; Randles, 46; and Delta, 51 miles.

St. Paul, Black Hills & Pacific.—It is announced that March 30 has been fixed as the date upon which con-

tracts will be let for grading about 100 miles of road from Dickinson, Dak., southward. The grading on about 25 miles between Aberdeen and Oakes, Dak., is already completed, and grading on the rest of the line will probably begin about May. Locating surveys have been made from Mandan to Rapid City, 306 miles, and from Oakes to Aberdeen, besides other branches. The construction headquarters will be at Mandan, Dak. W. L. Richards is Chief Engineer.

San Antonio & Aransas Pass.—Grading has been completed on the extension northwest from Shiner to Gonzales, Tex., about eight miles. Track will be laid as soon as the extension to Houston is completed.

San Francisco & North Pacific.—The Cloverdale & Ukiah extension is now open to Hopland, Cal., 14 miles from Cloverdale, and it is expected to have the line opened to Ukiah, 14 miles further, by the end of this month.

Santa Clara Belt.—This company has been incorporated in California to build a road to extend from Saratoga to Santa Clara and San Jose, a distance of twelve miles. The capital stock is \$300,000.

St. Louis & San Francisco.—Maitland, Phelps & Co., of New York, offer at 97½ and accrued interest the first mortgage collateral trust 5 per cent. gold bonds of the road. The bonds are issued at not more than \$20,000 per mile on roads constructed or acquired, and are secured by a deposit with the Union Trust Co. of first mortgage bonds and a majority of the stock covering such roads and their equipment.

Utah & Arizona.—It is expected to let the contract for constructing this road in the spring, though the financial arrangements have not yet been quite completed. As has already been stated the line is an extension of the San Pete Valley road, and it is to extend from the terminus of that road at Chester south via Ephraim City to Manti, Utah, a distance of 17 miles. Surveys have not yet been made.

Western New York & Pennsylvania.—The projected extension from Emporium to Williamsport is now being surveyed. The line is designed to facilitate an interchange of traffic between this road and the Philadelphia & Reading, by which the latter road would have a short connection with Buffalo, and the former reach Philadelphia over the Philadelphia & Reading.

West Virginia, Pineville & Tennessee.—Preliminary surveys for this road have just been completed from the Breaks of Sandy to Pineville, W. Va., and thence south to a point on the Tennessee state line.

Williamsport & North Branch.—A bill in equity has just been filed in the court at Williamsport, Pa., asking for the appointment of a Receiver for the road. The bill alleges that there has been an over issue of 8,400 shares of stock. It is alleged that sales have been made to two different parties of what the purchasers supposed to be a controlling interest in the stock. It is said that an arrangement was made with G. L. Sanderson, by which he was to furnish funds for extending the road, for which he was given as collateral \$500,000 of the capital stock out of \$720,000 authorized stock. When Sanderson demanded repayment of the loan, it is stated that an agreement was made by which he was to secure the repayment from the proceeds of a sale of the road, and that he was authorized to negotiate the sale. He interested several persons in the road, and a new board of directors was organized, who decided to connect the line with the Philadelphia & Erie. In the meantime it is alleged the officers issued 4000 new shares and sold them to parties who also organized a board of directors. And now each board is declaring that it is the only right and lawfully constituted board, and that the other is altogether fraudulent and not to be recognized.

TRAFFIC AND EARNINGS.

The Inter-state Commerce Commission.

The Commission, in the case of the Chamber of Commerce, of the city of Milwaukee, against the Flint & Pere Marquette and the Detroit, Grand Haven & Milwaukee, after discussing and defining what constitutes the through rate on wheat, flour and millstuffs, has decided that the rate of Feb. 1, 1888, on these articles from Minneapolis to Eastern points was a through rate, and has dismissed the petition.

GRAIN RATES AT BALTIMORE.

Messrs. Walker, Schomaker and Bragg, of the Inter-state Commerce Commission, held an inquiry at Baltimore last week concerning the alleged irregularities in the rates on corn from the West to that city. W. H. Joyce, General Freight Agent of the Pennsylvania, testified that the reduction of grain rates from the West to the seaboard made by his company in November was in consequence of the discovery that large sales of grain were being made in Nebraska for the Baltimore market higher than the market quotations. This suggested that a cut was made in railroad rates, presumably by the Baltimore & Ohio, which was verified, and then the Pennsylvania made an open rate to meet its competitors, which resulted in very heavy shipments. The through rate continued until Dec. 16. Of course all grain in cars on that day had to be carried through at the reduced rate and some of it did not reach the Baltimore elevators until six weeks after Dec. 16. His company had to rely upon the statements of the initial company as to the time of loading.

The tariff was restored Dec. 17, but it appears that even when full rates were maintained the Pennsylvania system was partly to a rate of 34 cents from Lincoln, Neb., to Baltimore, of which the proportion east of the Mississippi River was only 17 cents. There was no evidence as to whether these special rates from Nebraska points were published or reported to the Commission.

General Freight Traffic Manager Frank Harriott, of the Baltimore & Ohio, testified concerning the rates on his road. He denied knowledge of any concession to the firms alleged to have been favored, but the questions and answers as reported give no clear light on the methods of making and dividing the rates. Various merchants testified that their competitors underbid them 2 cents on grain bought in Nebraska. They complained that when they got reasonable rates there was a scarcity of cars, and when cars became plenty they could not get suitable rates. The firm alleged to have been favored denied having any special arrangement with the Baltimore & Ohio.

The Baltimore American states that the heavy corn traffic at that port is a direct result of its geographical and other natural advantages and of the better system of inspection in force there. In consequence of these advantages heavy dealers established houses in that city 10 years ago, but the moderate crops of corn each year until 1888 have prevented the operation of the natural laws until now.

Traffic Notes.

F. H. Peavey & Co., of Minneapolis, have formed the Pacific Elevator Co., for the purpose of doing a grain buying business on the lines of the Oregon Railway & Navigation Co. They propose to build the coming season storage warehouses at 29 different towns on the line of that company's railroad.

The Golden Gate Special now carries mail pouches, so that once a week there is a mail between New York and San Francisco in 113 hours.

The Chicago Car Service Association has granted the request of the grain dealers that charges for car service (demurrage) shall be uniform; that notices of arrival be given at uniform hours each day, and amending the rules concerning the inspection of grain. Certain roads had continued the old rate of \$2 a day on certain traffic, thus working a discrimination. The modifications in the rules will give consignees half a day more time than they have hitherto enjoyed.

Among the outside agencies recently abolished by the Erie was the Kansas City office of the Erie Dispatch; and it is stated that this is the third freight line that has withdrawn its agency from Kansas City within a month.

It appears that there are no new second class sleepers running on the transcontinental roads. The Pullman Co. has taken control of the cars which were already running, and has acquired from the Atchafalaya and the Union Pacific a total of about 150 cars of this class. It is stated that the Denver & Rio Grande is the only transcontinental line which has not entered the new arrangement with the Pullman Co.

The Central of Georgia runs a through sleeping car between Savannah, Ga., and Birmingham, Ala., via Macon and Columbus.

Shipments of oranges from Southern California eastward are now heavy. Fourteen car-loads recently started from Los Angeles on one train. The yards in that city are full of refrigerator cars engaged for this traffic.

One of the most serious complaints concerning the cutting of east bound rates on grain recently made, was based on the condition of business at Peoria, where it is stated that shippers have combined to send their goods by roads whose billing is not inspected by the officers of the Central Traffic Association. By the aid of these roads it is stated that the divisions of through rates from points west of the Mississippi River have been manipulated so that the rate to New York was cut 4 cents or more. The Joint Rate Committee of the Eastern and Western roads, composed of Chairmen Fink, Blanchard, Midegley and Faithorn, has received authority from the associations to stop the manipulation of rates at Peoria and to enforce compliance with the provisions of the joint freight agreement by any means the committee may elect. Proceedings, it is semi-officially announced, will be begun soon, and the aid of the Inter-state Commission will be invoked, if necessary.

The Inter-state Commerce Railway Association.

President Perkins, of the Chicago, Burlington & Quincy, signed the articles of agreement on Friday last. At the meeting in Chicago on Tuesday and Wednesday of this week, all the roads mentioned in the agreement were represented except the Illinois Central; Kansas City, Fort Scott & Memphis; Wisconsin Central; Chicago, Burlington & Quincy, and Missouri, Kansas & Texas. Committees were sent to induce these roads to come in, but without success, and on motion of Mr. Adams it was unanimously

Resolved, That the presidents of the companies which have signed the proposed agreement of an Inter-state Commerce Association do now proceed to perfect the agreement and the organization of that association without waiting for the assent of any additional companies thereto.

It was also voted, That the plan of agreement be referred to Messrs. Huggitt, McMullen, Stone, Truesdale, Newman and Howe, as a committee to report such changes of detail therein as may be necessary or expedient in view of the failure to obtain the assent of certain companies thereto and that such committee be instructed to report at 11 a. m. to-morrow (Thursday).

The directors of the Illinois Central, on the advice of its counsel that the charter of the company precluded it from becoming a party to the Association, instructed the President not to sign the agreement, but at the same time adopted resolutions giving the Association such moral support "as shall not be inconsistent with the best interests of the company." It is reported that the court authorized the receivers of the Missouri, Kansas & Texas to join the Association.

Iowa Rates.

The Chicago, Burlington & Quincy has concluded to adopt the Commissioners' tariff on all classes and commodities, with only such exceptions as were made by the Commissioners in the decision in the Burlington case.

The Burlington has reduced its passenger service in Iowa 8,000 miles per month, and it is announced that this policy will be pursued still further in order to reduce expenses proportionately to the reduction in rates.

The Iowa Railroad Commissioners have refused to substitute the Illinois distance tariff for their own. They told the railroad men they had determined to first test thoroughly their present Iowa schedule. If it proved unremunerative, then they would promptly advance it.

Weighing Live Stock.

The Western Railroad Weighing Association has adopted the following agreement concerning live stock rates. It was found that discriminations took place owing to the fact that the cars varied in length. The committee recommended that the weighing of live stock be continued east of the Missouri River and east of the state of Kansas, provided the St. Louis lines shall in no case be required to charge more per car than the tariff car-load rates in effect Dec. 31, 1888, it being understood that said tariff rates per car are to be applied on 30 ft. cars and the agreed differentials on cars of greater or less dimensions, as follows:

	Per cent.
Less than 20 ft.	91
Twenty-nine to 30 ft.	100
Over 30 ft. to and including 32 ft.	104
Over 32 ft. to and including 33 ft.	107
Over 33 ft.	110

Provided further that the Missouri Pacific and Kansas City, Fort Scott & Memphis will charge by weight on live stock from points in Missouri to Kansas City, but shall not be required to exceed the car-load rates from the intermediate points in Kansas, taking the highest rate per car to Kansas City according to the length of car loaded as above provided.

The committee further recommend that all lines west of the Missouri River continue the hundred pound basis on inter-state shipments except as above provided.

Passes for Land Agents.

The passenger department of the Central Traffic Association has resolved that, whereas, some of the lines beyond the termini of the Central Traffic Association are making application for time and annual passes, and other forms of free transportation, for so-called land agents, with a view of canvassing car territory in the interest of cheap land excursions, and it having been fully demonstrated that these so-called land agents are largely responsible for demoralization in west-bound rates which result in the organization of parties of so-called land buyers; therefore be it resolved, that no such requests should be honored, and that a copy of this resolution be sent to every line in the territory of this Association, with the request that they concur in this action.

Cotton.

The cotton movement for the week ending Feb. 15 is reported as follows, in bales:

	1889.	1888.	Inc. or Dec.	P. c.
Receipts.....	68,558	40,446	I. 28,112	69.5
Shipments.....	84,792	48,668	I. 36,124	74.2
Stock.....	320,287	360,441	D. 40,154	12.5
Exports.....	135,670	84,137	I. 51,533	61.2
Stock.....	65,890	62,337	I. 3,553	79.4
Stock.....	891,584	901,681	D. 10,097	11.0

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, Feb. 16, amounted to 66,560 tons, against 61,891 tons during the preceding week, an increase of 4,669 tons, and against 57,263 tons during the corresponding week of 1888, an increase of 9,297 tons. The proportions carried by each road were:

	W'k to Feb. 9.		W'k to Feb. 16.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	4,737	7.6	5,307	8.1
Wabash.....	7,391	11.9	7,369	11.0
Lake Shore & Mich. So.....	7,101	11.5	7,408	12.1
Pittsburgh, Ft. W. & Chicago.....	7,216	11.7	9,334	14.0
Chicago, St. L. & Pittsburgh.....	6,600	10.7	7,888	11.8
Baltimore & Ohio.....	4,629	7.5	4,515	6.7
Chicago & Grand Trunk.....	12,412	20.1	2,961	19.4
N. Y., Chicago & St. Louis.....	5,690	9.1	5,781	8.8
Chicago & Atlantic.....	6,145	9.9	5,297	8.1
Total.....	61,891	100.0	66,560	100.0

Of the above shipments 4,416 tons were flour, 35,082 tons grain, 2,742 tons millstuffs, 3,908 tons cured meats, 3,132 tons lard, 7,247 tons dressed beef, 162 tons flaxseed, 946 tons butter, 1,565 tons hides, 182 tons wool, and 3,782 tons lumber. The three Vanderbilt lines together carried 29.9 per cent. of all the shipments, while the two Pennsylvania lines carried 25.8 per cent.

Coal.

The coal and coke tonnage of the Pennsylvania, originating on lines east of Pittsburgh and Erie, for the week ending Feb. 2, and the year to that date, was as follows:

	Coal.	Coke.	Total.
Total for week ending Feb. 9.....	186,352	84,605	270,957
Total for year 1889 to date.....	1,202,618	525,270	1,727,888
Total for year 1888 to date.....	1,355,744	482,712	1,838,456

The anthracite coal tonnage of the Belvidere division of the United Railroads of New Jersey division for the same periods was as follows:

	1889.	1888.	Dec.
For week ending Feb. 9.....	20,880	32,629	11,748
For the year 1889 to date.....	147,898	199,403	51,505

The Cumberland coal trade for the week ending Feb. 16 amounted to 49,917 tons, and for the year to that date 365,689 tons.

Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

	1889.	1888.	Inc. or Dec.
Month of December.....	\$63,815	\$64,632	D. \$817
Gross earnings.....	42,519	51,558	D. 9,039
Oper. expenses.....	\$21,296	\$13,074	I. \$8,222

NEWPORT NEWS & MISSISSIPPI VALLEY.
KENTUCKY CENTRAL.

	1889.	1888.	Inc. or Dec.
Month of December.....	\$87,193	\$81,137	I. \$6,056
Gross earnings.....	44,046	49,680	D. 5,635
Oper. expenses.....	\$43,147	\$37,457	I. \$5,690

CHESAPEAKE, OHIO & SOUTHWESTERN.

	1889.	1888.	Inc. or Dec.
Month of December.....	\$183,127	\$203,175	D. \$20,048
Gross earnings.....	105,963	127,722	D. 21,759
Oper. expenses.....	\$77,163	\$75,453	I. \$1,710

Month of December.....

	1889.	1888.	Inc. or Dec.
Month of December.....	\$323,732	\$240,308	I. \$83,424
Gross earnings.....	85,620	305,375	D. 219,755
Oper. expenses.....	97,224	114,410	D. 17,186

	1889.	1888.	Inc. or Dec.
Month of December.....	63,815	64,632	D. 817
Gross earnings.....	21,296	13,074	I. 8,222
Oper. expenses.....	13,074	8,222	I. 4,852

	1889.	1888.	Inc. or Dec.
Month of December.....	122,230	134,512	D. 12,282
Gross earnings.....	18,097	39,930	D. 21,833
Oper. expenses.....	39,930	36,076	I. 3,854

	1889.	1888.	Inc. or Dec.
Month of December.....	330,359	360,576	D. 30,217
Gross earnings.....	38,367	59,003	D. 20,636
Oper. expenses.....	183,400	141,988	I. 41,412

	1889.	1888.	Inc. or Dec.
Month of December.....	81,142	15,112	I. 66,030
Gross earnings.....	2,167,674	2,163,388	I. 4,286
Oper. expenses.....	622,686	936,449	D. 313,763

	1889.	1888.	Inc. or Dec.
Month of December.....	1,940,627	2,191,563	D. 250,936
Gross earnings.....	780,674	872,637	D. 91,963
Oper. expenses.....	457,576	599,165	D. 141,589

	1889.	1888.	Inc. or Dec.
Month of December.....	108,183	126,683	D. 18,500
Gross earnings.....	70,727	90,213	D. 19,486
Oper. expenses.....	23,850	36,474	D. 12,624

	1889.	1888.	Inc. or Dec.
Month of December.....	189,481	190,354	D. 873
Gross earnings.....	118,421	77,318	I. 41,103
Oper. expenses.....	110,427	126,414	D. 15,987

	1889.	1888.	Inc. or Dec.
Month of December.....	25,474	20,534	I. 4,940
Gross earnings.....	335,582	371,205	D. 35,623
Oper. expenses.....	35,635	75,773	D. 40,138

	1889.	1888.	Inc. or Dec.
Month of December.....	245,250	171,811	I. 73,439
Gross earnings.....	132,817	68,237	I. 64,580
Oper. expenses.....	90,224	110,240	D. 19,416

	1889.	1888.	Inc. or Dec.
Month of December.....	26,893	45,036	D. 18,143
Gross earnings.....	\$6,899,901	\$7,261,754	D. \$361,853
Oper. expenses.....	2,167,859	2,468,106	D. 300,247

	1889.	1888.	Inc. or Dec.
Month of December.....	2,980,084	2,440,832	I. \$539,252
Gross earnings.....	2,848,075	3,005,962	D. 157,887
Oper. expenses.....	771,446	789,057	D. 17,611

	1889.	1888.	Inc. or Dec.
Month of December.....	732,993	764,549	D. 31,556
Gross earnings.....	235,739	241,389	D. 5,650
Oper. expenses.....	1,379,834	1,352,526	I. 27,308

	1889.	1888.	Inc. or Dec.
Month of December.....	99,539	185,963	D. 86,424
Gross earnings.....	2,026,319	2,276,193	D. 249,874
Oper. expenses.....	445,960	479,567	D. 33,607

	1889.	1888.	Inc. or Dec.
Month of December.....	23,789,168	27,140,725	D. 3,351,557
Gross earnings.....	5,955,055	12,363,203	D. 6,408,148
Oper. expenses.....	25,832,975	27,140,725	D. 1,307,750

	1889.	1888.	Inc. or Dec.
Month of December.....	8,680,454	11,130,459	D. 2,450,005
Gross earnings.....	6,414,422	6,980,873	D. 566,451
Oper. expenses.....	1,759,188	2,307,582	D. 548,394

	1889.	1888.	Inc. or Dec.
Month of December.....	1,063,386	1,262,880	D. 199,494
Gross earnings.....	104,556	90,472	I. 14,084
Oper. expenses.....	1,583,549	1,740,551	D. 157,002

	1889.	1888.	Inc. or Dec.
Month of December.....	320,938	442,672	D. 121,734
Gross earnings.....	1,373,449	1,491,388	D. 117,939
Oper. expenses.....	345,073	428,147	D. 83,074

	1889.	1888.	Inc. or Dec.
Month of December.....	4,876,051	4,167,707	I. 708,344
Gross earnings.....	1,025,973	1,025,247	I. 726
Oper. expenses.....	2,671,365	2,018,068	I. 653,297